

Dr. Scott Stevenson, PhD

A photograph of a bodybuilder, likely Dr. Scott Stevenson, posing in a bodybuilding competition. He is a middle-aged man with a grey beard and long hair tied back, wearing a purple posing trunks. He is in a side-on pose, flexing his muscles, with a wide, enthusiastic smile. The background is dark and out of focus.

Be Your Own Bodybuilding Coach

**A Reference Guide For Year-Round
Bodybuilding Success**

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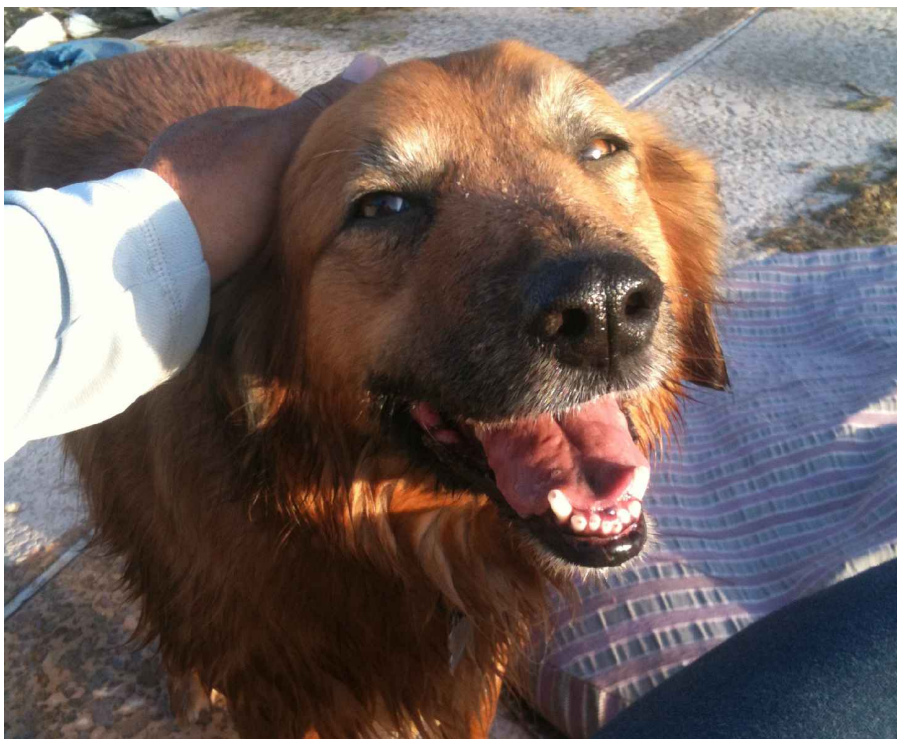
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1) Bodybuilding 2) Nutrition 3) Exercise 4) Muscle Growth
First Edition

Be Your Own Bodybuilding Coach™

**A Reference Guide for Year-Round
Bodybuilding Success**

Dedication



For his unconditional love, life lessons, and being the light at my darkest hour.

“That’s My Boy!!!”

Preface and Acknowledgments

“Give a Man a Fish, and You Feed Him for a Day. Teach a Man To Fish, and You Feed Him for a Lifetime” -Origin uncertain

Thank you for trusting in me as you reap the benefits of bodybuilding. I’ve written this book from my personal perspective that, as trite as it may sound, life’s deepest value and greatest meaning are derived from our experiences along the “journey,” much more so than the results that mark our “destination.” During my 35+ years as

a bodybuilder (and 20 + yr as a competitor), my endeavors have been most rewarding when I was learning about bodybuilding physiology, tinkering with my diet and supplement regimen, and testing myself in the gym. If you feel the same, you'll enjoy this book greatly.

Many people would love to be gifted a high-end sports car, and I'm certain that many bodybuilders would, given a genie who could grant such a wish, gladly be transformed into the next Mr. Olympia minus the effort that comes with producing such a physique. This is not the perspective of the hotrod enthusiast who relishes the process of toiling away in his garage night after night. This book is for you, the bodybuilder who wants to **be your own bodybuilding coach**, because you sense that intrinsic value lies in the act of bodybuilding as much as in the physique you end up creating.

In the past decade or so, I've noticed that hiring a bodybuilding/physique coach is considered less of a luxury, and perceived as almost a necessity by many competitors, as if preparing for a competition can't be done otherwise. The benefits of learning by making one's own mistakes are downplayed by (many) coaches seeking to expand their own earning potential. Because you can and might end up making more mistakes, competing without a coach is considered disadvantageous, further perpetuating the hiring of coaches to "keep up with the Joneses." Unfortunately, in many cases, this means less learning on the part of competitors (many coaches don't naturally take on the role of teacher), and thus the creation of a marketplace with less knowledgeable bodybuilders who tend to hold coaches to a lower standard of knowledge (and effectiveness).

Don't get me wrong: This is not to say that there aren't many good coaches out there, who are phenomenally knowledgeable and pass that along to their clients. Some of the best coaches I know got this way by learning from – you guessed it – the best coaches they could hire. Learning from many masters is an excellent way of becoming one. (This is vastly different from "coach hopping," where an athlete learns little, gives her/his coach too little time to learn her/his physique, and hires a new coach who seems to be standing where the grass is greener.) You can consider this book a detailed map of the bodybuilding landscape that comes bundled as an **annual plan** and **resource manual** to make sure you are well-equipped for your journey of self-exploration. I give you my best instructions for deciding when, how and why to use the tools of bodybuilding (skinfold calipers, perceived recovery scales, nutritional supplementation, training strategy, dietary adjustments, cardio, etc.) and thousands of scientific references (see note below) and other bodybuilding resources to further your expertise. To be your own bodybuilding coach, you will still have to do the "heavy lifting" (pun

intended) of learning how you personally can improve as a bodybuilder, rather than entirely relying upon someone else to make these decisions for you, but that's the fun of it. Just like it's more gratifying to have scaled Mount Everest with the assistance of a skilled Sherpa than to have been deposited on the summit via helicopter, my hope is that this book will make your bodybuilding endeavors more efficient, successful, and deeply rewarding for many years to come. Hopefully, this purchase will save you a few bucks (quid, etc.) in the process as well.

I believe that coaching (yourself) is an art, grounded in personal experience (as a bodybuilder and in working with others) and informed by scientific evidence. You'll notice a vast number of **scientific citations** in this book, reflective of how I've blended decades of "in the trenches" experience as a personal trainer, bodybuilder and bodybuilding coach with nearly as many years as a student of exercise science. Please consider these citations (hyperlinked to the [References](#) in the e-book) as **an extension of the book's content**, provided to you not only to substantiate my ideas, but also **so you can follow up on topics per your curiosity**. (As an aside, be wary of literature that doesn't properly cite sources – more on this in [Chapter 5](#).) Literally thousands of individuals have impacted my growth as a person, bodybuilder, academic, practitioner and coach, and thus the content of this book. Thanking them all would be impossible, but if you've bothered to read this far, and don't see yourself mentioned, you can be certain that your interest is greatly appreciated! I'd like to thank **my parents, Walter and Darlene**, for supporting my major life decisions with **unconditional love**. The freedom they granted me to grow in (almost) whatever direction life might take me has afforded me invaluable experiences. I'd especially like to thank my training partners (most notably David Henry II, Mike Gustavsson, and Gary Harpole II), my academic mentors (Dr. Roger Farrar and Dr. Gary A. Dudley), the many competitors and fellow gym rats I've known over the years (far too many to name), numerous friends with whom I've collaborated in the world of bodybuilding (especially Ken "Skip" Hill, John Meadows, Jordan Peters, and Dante Trudel), and perhaps most importantly, the many people who have trusted me to guide them along their respective fitness and bodybuilding journeys.

This and my other book [Fortitude Training®](#), as well as future publications, will be centralized online at my website and discussion board:

www.integrativebodybuilding.com [Alternatively you can visit www.byobbcoach.com or www.BeYourOwnBodybuildingCoach.com.]

Please feel free to visit the forums there for follow-up

questions, to communicate with fellow bodybuilding enthusiasts and/or to hire me for consultation and/or speaking appearances.

Yours in Health
and Strength,
Scott Walter
Stevenson, PhD

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Chapter 1 – The BIG PICTURE

“The ordinary man can achieve greatness if he’s willing to fuse skillful measures with extraordinary effort.” –Scott Stevenson

Because you have purchased this book, I assume you seek a competitively lethal combination of ridiculous muscle mass and nasty conditioning, while being both dry **and** full on stage. If so, you bought the right book. In “Be Your Own Bodybuilding Coach” I lay out how to put together your **own** year-long bodybuilding strategy, covering a broad range of aspects of training, diet, supplementation and recovery (and plenty in between). This book is meant to help you plan your attack, as well as a **reference source**, for you to call upon as needed. I can only lead you to water though: It's up to you to implement the knowledge, execute the tactics and apply the strategies, and then rule the stage.

Although everyone’s competitive calendar is different, many bodybuilders have a “**competitive season**” composed of competing in just a few tightly groups shows. So, it’s easiest to view a “**competitive bodybuilding year**” as composed of three periods, which I’ve used to organize the larger structure of this book:

- **Post-Contest:** The ~1-2 month period after your competitive season where you restore (sanity, relationships, normalcy) and regain (lost muscle and strength).
- **Off-Season:** The ~6+ month period when you will make muscular gains that will show up in an improved physique on stage.
- **Pre-Contest:** The ~3-4 month period when you strip body fat to present your hard-earned physique.

Essentially, you would follow some semblance of the three periods depicted below:



Figure 1: Three Periods of the Competitive Bodybuilding Year

Again, the above pre-supposes that your competitions will be

clustered into one part of the year. It's possible that you may move between Pre-Contest and Post-Contest if you compete more frequently during the year. (This is the struggle of some of the highest level IFBB Professionals who compete regularly in hopes of earning placing points en route to a Mr. Olympia qualification.)

Planning Your Year: Your Personal Bodybuilding Inventory (PBI)

To develop a successful year-long strategy, taking stock of your **resources** and developing **goals** is absolutely paramount. A coach would do this with an intake form and an initial consultation, via email, on the phone and/or in person. You can do the same by taking an honest **Personal Bodybuilding Inventory** of the critical elements that make up your bodybuilding efforts – everything from medical issues to posing strengths to diet to financial resources. Each of the things in the Personal Inventory (PBI) form will help you devise the initial trajectory of your yearly plan.

Take a close look at the PBI right now. If you could fill out the PBI form entirely already, you'd probably not have purchased this book. Still, I'd like you to give it a good shot, right now.

Go on... Fill it out. I'll wait for you... (See you in about 15 minutes...)

You could (and should when in doubt) fill out your Personal Bodybuilding Inventory (from scratch) **at any time** during the year to take stock of yourself and your progress. At a minimum, doing so three times per year, i.e., at the **beginning of each of the major periods of the competitive bodybuilding year** (Post-Contest, Off-Season and Pre-Contest) makes sense, as a checkpoint of progress towards goal achievement and the need to refine, adopt more or even abandon goals you may have set for yourself. Doing this also is paramount in **figuring out what works for you individually**. A good bodybuilding coach learns his client's preferences, physiological responses to food, training, supplements, *etc.* and is in a constant state of learning (and re-learning) how to ensure progress (and when to take a break). The Personal Bodybuilding Inventory form is a way to **gain perspective** and refine your efforts.

Life "happens" to all of us, of course, and sometimes bodybuilding must be set to the side. Being your own coach is about being able to step outside your sometimes blurry perspective of own your life's circumstances and view with some **objectivity** how your bodybuilding pursuits at a given moment fit into the "Big Picture."

1.1 Personal Bodybuilding Inventory Form

PERSONAL BODYBUILDING INVENTORY

p. 1

Name: _____ Date: _____

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Goals Specific, Quantifiable: What, How, Where, When, Why and What For?

Goal #1 _____

Goal #2 _____

Goal #3 _____

Goal #4 _____

Goal #5 _____

Medical

Injuries, Arthritis, etc?

List Each _____

Plan to Address Each _____

Other Conditions that May Hamper Gains?

List & Plan to Address Each: _____

Weight Training: What's worked and Why? _____

What Hasn't worked? Why? _____

How do you plan to weight train this year? _____

Do you have a training partner and does he / she enhance your training? _____

(How can you improve/remedy the above?) _____

Cardio: What's worked and What Hasn't

What kind of Cardio do you plan to do?

Offseason?... LISS HIIT Other? Mode: _____

Pre-Contest?... LISS HIIT Other? Mode: _____

Do you have adequate facilities?

Should you seek out another gym?... _____

Name: _____ Date: _____

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Diet***Muscle Gaining Strategies***

What's Worked? _____

What Hasn't? _____

What do you plan to do? _____

Fat Loss Strategies?

What's Worked? _____

What Hasn't? _____

What do you plan to do? _____

Foods: What Foods do you "hate?" _____

What Foods do you Love? _____

Do you have trigger foods? _____

What foods are Most Conducive to your Bodybuilding Success? _____

What Foods should you be eating more of? _____

How will you stay away from Trigger foods? _____

Supplementation

What's Worked? _____

What Hasn't? _____

Name 1-2 Supplement Strategies you would like to implement: _____

How will you gauge effectiveness? _____

Presentation (Posing, Skin Care, Suits, etc.)

Can you improve in these areas? How will you do so? _____

Notes:

List Any other things here that have not been noted above _____

What will you do to address these other important items?... _____

**NOTE: This Form is available at my website: www.byobbcoach.com.
See Resources.**

1.2 Weekly Progress Markers

Bodybuilding is a visual (subjective) sport. Trite but true, judges won't ask how much you bench, squat, deadlift, or curl, wonder what your estimated body fat percentage is, or even care how much you actually weigh (although the larger competitor may have an advantage, all other things being equal).

Still, these sorts of objective measures have their place, as strength gains (or at least some form or load progression in the context of muscular overload) are intimately tied to gains in muscle size(1). When the mind is playing tricks on us, skinfolds or other methods of body composition estimation can be used to impartially gauge changes in muscle mass relative to body fat (see Goals #1 and #2 below). Circumference (girth) measurements can also be helpful, especially for areas such as the arms or calves (often “weak” areas) where body fat is typically low.

This being said, the following components can be used (year round) to document **weekly progress** and assess how to change training, diet and other lifestyle parameters related to bodybuilding (which means almost all of them). Here is how a weekly checkin might look for a coach, and thus what you can document, in being your own coach.

Table 1: Typical Weekly CheckIn Data.

Date: _____

Previous and Current Week's Measurements for:

- Morning **bodyweight** after using the bathroom.
- **Skinfolds:** 2-4 sites (See Common Goal #1 below for more details on measuring skinfolds.)
- **Girth** measurements (waist, arm, calf, etc, depending on context)
- **Strength** measurements for selected lifts (those which are the focus of progressive overload). This might be Loading sets in Fortitude Training®, for example.
- **Perceived Recovery Status Scale Measurements** (see below and Chapter 7 - Resources)
- **Female competitors** should also make note of time point in the **menstrual/ovarian cycle**, whether menstruating, etc., and suspected menstrual cycle-related water retention. A phone/computer application can be quite useful here.

Current Diet (noting most recent changes), Supplements Etc.

- Assessment of which **meals** are the least and most filling and/or for which one is the least and most hungry.
- **List** of current supplements, drugs (Rx and otherwise), etc.

General

- **Follow-up comments** on previous week's adjustments in training, diet, supplementation.
- Any **other** relevant insights or commentary.
- Assessment of any of the **major GOALS** (see below) you have set for the particular Period of the year.

PICTURES (Previous and Current Week)

- In **controlled lighting** (indoors away from sunlight), the same location in the room (both camera and subject). A minimum of 3-5 poses highlighting areas of focus (e.g., weak muscle groups).
- If posing/presentation is a primary goal, all **mandatory poses** and even **video** of posing with transitions could be included and assessed.

1.3 Goal Setting

“Where the mind goes, the body follows.” -Origin uncertain

Don't worry if “I don't know” is your best answer in filling out much of the PBI form. The purpose of this book is to remedy that in the pages of this book. The most important aspect of all of this is Goal Setting.

Goals are like your destination: If you don't know where you're going, you can't possibly know how to get there. The more specific the goal, the better (within reason). If you want to plan an ocean-filled vacation, you'd not only pick a coastal city, but you'd also find at least one beach to visit and a place to stay as close to the beach as possible, even on the beach if this is within your budget, and book the dates of the vacation. Similarly, if you want to be a successful bodybuilder, you should pick a reasonable physique goal with a detailed description and a construct a timeline for building that physique. Even the most consistent hard work might not manifest in a way you truly desire if you've not set a goal in mind. In other words, working consistently, but aimlessly is not likely to be fruitful. This might mean, for example, that you set a goal to winning your weight class at your NPC state championships. Such a goal would be reasonable, given:

- Your 3rd place finish last year in that weight class at the same show.
- You didn't weigh in at the top of your weight class, so you can gain ~10lb and still compete in the same class.
- Your previous conditioning was equal to or better than competitors who beat you last year (based on third-person and judges' opinions), and you have documented body fat levels during Pre-Contest prep using both pictures and skinfolds of trouble areas.

Specifying the following **features** of your goal will make them **actionable**, and thus (more easily) attainable:

- **What:** Bodybuilding Outcome: **Amount** of Muscle Gain, **Specific** Placing, **Improved** Conditioning, *etc.* For some, it could be even **more subjective** such matching/achieving the look of a given well-known physique (such as "Match Serge Nubret's physique at the height of his career based on these classic photos of him"). Still, I would suggest that such goals are defined

quantitatively, in some way, such as with quantifiable stats for said person (height, weight, approx. body fat percentage, etc.)

- **How:** This will be largely covered in this book, but your goal statement should include a specific course of action (**strategies**) to carry it out, including ensuring that there is a **habit** (see below) driving the goal-directed behavior.
- **When/Where:** When and where is the show, end of the which yearly period (Post-Contest, Off-Season or Pre-Contest), etc.?
- **How Measured:** Skinfolds, DEXA, Pictures, Placing or even a Gym Strength measurement in some cases. (Matching a “goal physique” might mean replicating a famous photoshoot, including location and poses.)
- **Why/What For:** This may require some internal reflection, but is very important as the why is **your motivating force**, which may wane over time if not clear. ("Because it would be cool to post on Facebook" or "to silence the haters" may not sustain you for a 16-week diet, whereas "gaining muscle mass and improving as a bodybuilder is intrinsically valuable to me" is a great reminder of why you set bodybuilding goals.)

Habit Check

“Keep your thoughts positive, because your thoughts become your words. Keep your words positive, because your words become your behavior. Keep your behavior positive, because your behavior becomes your habits. Keep your habits positive, because your habits become your values. Keep your values positive, because your values become your destiny.” -Mahatma Gandhi (2)

Habits can be your best friend or your worse enemy.

One purpose of delineating your goals is to drive goal-directed behaviors that transform into habits, which are then, to some degree, **self-perpetuating**(3). It’s presumed here that you are already strongly internally motivated and living the “bodybuilding lifestyle,” so major lifestyle changes should not be needed. On the other hand, “if you always do what you’ve always done, you will always get what you’ve always got” (a truism attributed to many, including Ronnie Coleman) also applies. Ideally, this book will help you **refine your own habits**.

Examples of Common Goals

To help you construct a specific plan of attack, contextualize and coach yourself to three of perhaps the most common bodybuilding goals, I delve into these goals in the following sections:

- Add Size & Move up a Weight Class
- Improve a Weak Muscle Group(s)
- Improve Presentation (Posing)

Of course, you may have goals, such as getting to a certain body fat level on stage, placing-related goals, *etc.* Regardless, vital to reaching these goals will be keeping them in mind on a regular basis, i.e., by re-assessing with the weekly checkins and the Personal Bodybuilding Inventory as you transition from post-contest to Off-Season and into the Pre-Contest period. Your PBI can be where you organize and itemize (make a list) the materials, steps and other particulars that go into achieving each goal. (You may have noticed I use lists a good bit in the book, as well!) For instance, you might make do the following when filling out the BPI, as an adjunct to your goals:

- **Budget** the main **expenses** for the coming year (gym membership, supplement allotment, contest trips, organization membership, cost of tanning, *etc.*).
- **List the top supplements** you plan to use to maintain liver, cardiovascular, *etc.* health during the coming year, in the context of your diet.
- **Before the Diet Fog** of Pre-Contest hits: **Set reminders** to make hotel reservations, purchase plane tickets, set up tanning (and makeup) appointments, *etc.*
- **Before the Diet Fog** of Pre-Contest hits: Make a **Pre-Contest Packing List** to ensure you have everything ready when you leave to compete in your show. (You can Google many of these online, specific to women and men competitors in different divisions.)

COMMON GOAL #1: Add Size & Move up a Weight Class (Thinking Long Term)

Depending on how large you are and how much body fat you have to lose, as well as if you gain or lose muscle when dieting, you might end up anywhere between 15 and over 50lb above your stage

weight. Some factors to consider here are:

- How readily can you drop body fat (which relates to how much fat you can gain and when you would have to start Pre-Contest dieting)?
- How long will you have to diet?
- "New" muscle is most easily lost during Pre-Contest dieting, something I've seen commonly in clients. Will a crash diet undo any muscle improvements you have made?
- Are you moving up an entire weight class (or attempting to do so)? How much time does this reasonably take?
- Your overall size/weight (will you be a Lightweight or a Superheavy?)
- How much muscle mass do you lose (or gain) during contest preparation?

Thus you might construct a goal that reads:

"My goal is to move up to the heavyweight class, weighing in at or above 210lb with conditioning (based on pics and skinfolds) equivalent to last year. This would be achieved by: 1.) Not sacrificing muscle to make the Lightheavy (198lb limit) division; 2.) Gaining ~10lb of muscle above my peak muscle mass (based on DEXA) from last year; 3.) Reducing training volume and increasing frequency during the entire Off-Season (based on last year's impression that I was training excessively); 4.) Restricting my diet to weekly cheat meals (not cheat days)."

To give you perspective on (reasonable) Off-Season endpoints, the below Table breaks down **Off-Season weight** and **weekly fat loss**, assuming a **16-week Pre-Contest prep** to reach 4% body fat for men and a 9% for women competitors. **For women, divisions other than bodybuilding require higher levels of body fat.** [These 4% and 9% values are based on estimates of essential body fat for men and women (4, 5), as well as estimates of body fat in bodybuilders before a competition (6-8). The best (professional) female bodybuilders, who are very likely pharmacologically assisted, can clearly get to levels of body fat equal to those of the leanest men. The 9% value for women is a midpoint between what assisted and unassisted women might obtain. Values of 7% have been reported for individual women using older body composition methods(5, 9) and a DEXA-measured average body fat level below 10% has been published for a small group of women bodybuilders (8)]

- All NPC Men's and Women's bodybuilding weight

classes.

- 12%, 15%, 20% and an undesirable 25% Off-Season body fat .
- Scenarios of 5lb muscle loss, no change and 5lb of muscle gain during prep.

Scenario	Note	Pre-Prep Body Fat % & Weekly Fat Loss (lb/wk) [16wk prep]											
		Stage Ready BF%*	Wt. Class	Stage Ready Bodyweight	12%		15%		20%		25%		
					lb/wk	lb/wk	lb/wk	lb/wk	lb/wk	lb/wk			
Lose 5lb FFM during Prep (5lb FFM more needed in off-	Women's	9% LW	115	125	0.29	129	0.56	137	1.07	146	1.64		
		9% MW	125	135	0.31	140	0.61	148	1.15	158	1.77		
		9% LHW	140	150	0.34	156	0.67	166	1.28	177	1.97		
		9% HW	155	166	0.37	172	0.74	183	1.41	195	2.17		
	Men's	4% BW	143	162	0.86	167	1.21	178	1.87	190	2.61		
		4% LW	154	174	0.92	180	1.30	191	2.00	204	2.80		
		4% WW	165	186	0.98	192	1.39	204	2.14	218	2.99		
		4% MW	176	198	1.04	205	1.48	217	2.28	232	3.18		
		4% LHW	198	222	1.17	230	1.66	244	2.55	260	3.57		
		4% HW	225	251	1.32	260	1.88	276	2.89	295	4.04		
4% SHW	250	278	1.46	288	2.08	306	3.20	327	4.48				
No FFM loss during Prep	Women's	9% LW	115	119	0.25	123	0.51	131	0.99	140	1.53		
		9% MW	125	129	0.27	134	0.55	142	1.07	152	1.67		
		9% LHW	140	145	0.30	150	0.62	159	1.20	170	1.87		
		9% HW	155	160	0.33	166	0.68	176	1.33	188	2.07		
	Men's	4% BW	143	156	0.81	162	1.16	172	1.79	183	2.50		
		4% LW	154	168	0.88	174	1.25	185	1.93	197	2.70		
		4% WW	165	180	0.94	186	1.33	198	2.06	211	2.89		
		4% MW	176	192	1.00	199	1.42	211	2.20	225	3.08		
		4% LHW	198	216	1.13	224	1.60	238	2.48	253	3.47		
		4% HW	225	245	1.28	254	1.82	270	2.81	288	3.94		
4% SHW	250	273	1.42	282	2.02	300	3.13	320	4.38				
Gain 5lb FFM during Prep (Less off-season FFM gains)	Women's	9% LW	115	113	0.20	117	0.45	125	0.91	133	1.43		
		9% MW	125	124	0.22	128	0.50	136	1.00	145	1.56		
		9% LHW	140	139	0.26	144	0.56	153	1.13	163	1.76		
		9% HW	155	155	0.29	160	0.63	170	1.25	181	1.96		
	Men's	4% BW	143	150	0.77	156	1.10	165	1.71	176	2.40		
		4% LW	154	162	0.83	168	1.19	179	1.85	190	2.59		
		4% WW	165	174	0.89	180	1.28	192	1.98	205	2.78		
		4% MW	176	186	0.96	193	1.37	205	2.12	219	2.98		
		4% LHW	198	210	1.08	218	1.55	231	2.40	247	3.36		
		4% HW	225	240	1.24	248	1.76	264	2.73	281	3.83		
4% SHW	250	267	1.38	276	1.97	294	3.05	313	4.27				

*Does not include water / carb manipulation or account of off-season vs. precontest "bloat" and water retention.

Table 2: Estimates of weekly rates of fat loss during a 16-week prep to reach extreme contest ready leanness depending on starting body fatness and changes in fat-free mass.

Assessing Your Body Fat Levels: Professional Body Fat Estimation

To use the table above in construction a reasonable Off-Season muscle mass-related goal, one must be able to accurately (or at least reliably) assess body fat and thus fat-free mass. This is why many

meticulous bodybuilders have begun making use of methodology to estimate body fat percentage such as DEXA (dual-emission x-ray absorptiometry), the Bod Pod®, and good old underwater (hydrostatic) weighing. Of course, making weekly or bi-weekly measurements using these methods, may be time and cost-prohibitive. There is a solution, however.

To track body fat, I generally suggest clients pick 2-4 locations where a skinfold can be reliably and easily measured (by yourself and/or a partner), as part of a weekly checkin. These skinfolds should also be in **areas where you tend to hold body fat** (the key areas that you need to keep under control), so that the measurement is representative of your conditioning. [For example, many men will not put much on much body fat in their legs or arms, but instead gain fat in the abdominal, "love handle" and pectoral region (10).] For this purpose, It's OK to use a non-standardized location for your skinfold, i.e., one that doesn't match the standardized location used in published in fat estimation equation. As a general rule, by keeping the total of their fattest two areas below 17-18mm, most men will stay around 10% or so. By comparison, if the sum of the standardized (Durnin and Womersley) biceps + triceps + suprailiac + subscapular skinfolds is equal to 20mm, this corresponds to about 10% body fat (11).

To get the skinfolds you need, especially if you hold fat in the subscapular area on your back, you may have to have a friend or partner make measurements for you. It's best to **practice them several times a week (if not daily)** for a couple of weeks to develop skill so your measurements will be reliable. Here's a set of instructions for getting a good skinfold measure:

Do this right now, please, as you're sitting there reading this: Pinch the skin on the back your hand with the thumb and forefinger of your other hand, you'll see that just a couple millimeters to either side of the pinch, there is "loose" skin that is lifted away from the bones of your hand. If you had a 3rd hand to hold the calipers, you could put the prongs of the calipers on either side of that loose, lifted away skin, allow the caliper to press the skin together (the caliper has a spring in it), and then read the number. You can do the same thing with a fold of skin on your abdomen or another part of your body, pinching two sides of skin together (with one hand) and measuring (other hand) < ½ inch to either side of your fingers where the skinfold is pulled away from the muscle/bone below it. The calipers pressure should be what pushes the skinfold together when measuring, without extra pressure from you. Try also to get a nice fold with the two sides of skin parallel to each other. This will be harder to do with thicker skin and/or where there is more subcutaneous fat. Practice this 5-10 times with the sites you choose until you get a stable measurement (< 2 mm

variation) but switching from site to site and coming back to them in the rotation. (Don't just squeeze the same site ten times in a row. You'll not be practicing finding it, and you can squeeze water out of the skinfold and change its value, even if your measurement technique is dead on.) For your purposes (since we're not performing a clinical study here), you'll not need a pricey, research-quality caliper. Instead, you can pick up a cheap caliper (plastic model for ~\$20) at an online outlet like [EliteFTS.com](#).

Here's the cool part: If you make several measurements over the course of your bodybuilding year using a higher end body fat estimation (like DEXA), you can develop your own guesstimate (an estimate of an estimate) based on your own personal skinfold measurements.

For example, you might log your skinfold and DEXA measurements like this:

Date	Skinfolds		BF Estimate (DEXA)
1/6/16	Site A (Abs):	8mm	9.7%
	Site B (Suprailiac):	12mm	
	Site C (Pec):	6mm	
	TOTAL:	26mm	
4/6/16	Site A (Abs):	12mm	11.2%
	Site B (Suprailiac):	14mm	
	Site C (Pec):	8mm	
	TOTAL:	34mm	
7/6/16	Site A (Abs):	4mm	5.5%
	Site B (Suprailiac):	6mm	
	Site C (Pec):	3mm	
	TOTAL:	13mm	
10/6/16	Site A (Abs):	7mm	8.6%
	Site B (Suprailiac):	11mm	
	Site C (Pec):	5mm	
	TOTAL:	23mm	

Table 3: Example Log of Skinfolds vs. DEXA-Estimated Body Fat Percentage

These data could then be plotted as in the figure below to get a rough means of estimating what your DEXA-estimated body fat percentage (BF%) might be. (The mathematically inclined could even develop a regression equation that could be used to predict BF% from skinfold total.)

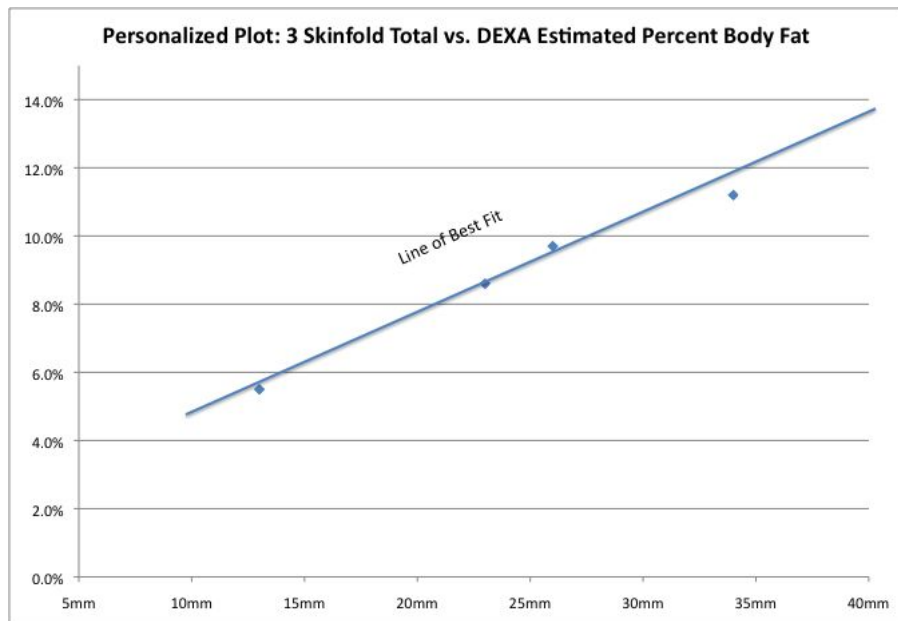


Figure 2: Example Plot of Skinfolds vs. DEXA Estimated Body Fat Percentage.

COMMON GOAL #2: Bringing up Weak or Lagging Muscle Groups

This is perhaps one of the most frustrating bodybuilding goals to pursue, and therefore the most rewarding if achieved. Improving a weak muscle group and perhaps even making it a relative strength is something quite impressive. (NOTE: I've created a short video on this topic that you can find on my [YouTube channel](#).) You might operationalize this kind of goal thus:

"I would like to add 1" to my upper arm ("flexed biceps") measurement above last Off-Season's max measurement by the end of this Off-Season, and I will do this via <insert selection of strategies covered below> ."

Of course, it should go without saying that one must be **eating enough food** to support recovery and muscular growth, typically such the body weight is going up overall. This is perhaps the fatal error I see most often made in trying to improve one's physique. After the first year or so of improvements, bringing up lagging muscle group specific gains most often requires gains in muscle mass overall. This being said, an excellent strategy to focus those incoming nutrients toward the lagging muscle group **is to eat more (the day) before training as well as the day after training the weaker muscle group(s)**. A rest day both before and after training (or easier training

sessions) can also shift recovery resources in favor of muscle growth where it's most desired.

In terms of training *per se*, one should be training progressively, but not at the expense of simply (sloppily) hoisting heavier weights in a manner that doesn't focus an overloading hypertrophic stimulus where desired. Beyond dietary (and site enhancement strategies, which I won't cover in this book), one can boil the training strategies for improving lagging bodyparts down to these four approaches:

- Exercise Execution and Selection & Honing the Mind to Muscle Connection
- Frequency of Training
- Workout Design: Exercise Sequencing and Daily Undulating Periodization
- Training & Dietary Structure: Prioritize Recovery of the Weak Muscle Group

Strategy 1 (Lagging Muscle Groups): Exercise Execution and Selection

Ask yourself: Are you executing movements in the best manner to stimulate your weak muscle group into growing? If are not sure, search the internet and ask questions (e.g., on my discussion board) to figure out what (biomechanical) variations, mental cues (e.g., drive elbows back/down to engage the lats) and other strategies (e.g., initiating the action with the targeted muscle group) can be employed to ensure this . If you are **not** doing exercises well, and placing sufficient stress on your weak area, training it more (with greater volume and/or frequency) is not a smart first strategy. You may merely be training “incorrectly” – in a way that hasn’t been working – more often, i.e., doing the same thing again and again, but expecting a different result. This will likely just lead to continued, frustrating stagnation.

The key here is to learn how to make the biomechanical adjustments to each exercise (body posture, limb positioning, grip and stance width, etc.) to put the stress of each exercise on the muscle you intend to train. Additionally, choosing the right exercise can be equally important. (It may boil down to semantics as to whether a doing a leg press with a wide vs. a narrow foot placement is a different exercise, or simply a different way to execute the same exercise.) To help you find exercises that you target muscle groups in a way you may never have, check out my [YouTube](#) channel and [Instagram](#) account.

Let's use chest/pecs as a common example. It is very common to hear from clients that they are "triceps and shoulder" dominant during pressing but dogmatically rely on chest pressing to train the pecs and thus have poor development there. In this case, you should first inspect form (execution) on chest presses that may be limiting both range of motion and activation of the chest due to 1.) Pressing with the elbows close to your side(12), 2.) Using a grip that is too narrow (12) and/or 3.) Having a "sunken in" chest and sternum not lifted (protracted shoulder girdle) during the press. [NOTE: It's been my impression that (flat) bench pressing is the most common mechanism of a pec tear and this fits well with the literature on this topic(13)]

Of course, going into this kind of detail for every muscle group and exercise is beyond the scope of this book, but I want to be clear that:

*Your number one goal should be to perform exercises so that you can feel the target muscle contracting hard (with which you have a good "**mind to muscle connection**" – See below). Ideally, you work through the largest range of motion to which the exercise lends itself. To fully develop a muscle, you may train it using different exercises, purposely selected to overload the muscle at different lengths. (E.g., triceps extension could be performed standing upright, pushing downward, as well as overhead, extending upward.) For those of us that aren't the genetic elite, generating an extraordinary growth stimulus from each and every workout can only be accomplished by optimizing load via careful attention to the biomechanics and selection of each exercise you do.*

More on the Mind to Muscle Connection

Developing your "mind-muscle connection," i.e., learning how to better activate and shift the load to your target muscle(s) when lifting is perhaps the most "old-school," tried and true method for making rapid improvements in a lagging muscle. This is essentially the neurological counterpart to the proper exercise selection and execution. The idea is thus to **both** choose exercises that you feel especially well in the target muscle **and** perform them in a way that fosters greater activation by making biomechanical adjustments, while also consciously focusing on the "mind-muscle connection" to that muscle.

Mind-muscle connection is difficult, but not impossible, skill to develop because so many muscle groups may be involved during a particular exercise. We know that mental imagery training – merely imagining lifting without actually exercising – can develop neural pathways in the brain (14, 15) thus improve strength performance(16-18), so it seems reasonable that, with "perfect"

practice, you can develop a “perfect” mind-muscle connection.

Exercise science tells us that **intentionally focusing on using a particular muscle can make a difference in activation**(19) and that bodybuilders are better at willfully contracting muscles intentionally during different tasks than untrained folks(20, 21). However, keeping the mind-muscle connection intact when training heavy may be the issue holding you back when trying to use the “big exercises” to bringing lagging muscle groups. Back to the example of chest used above, a prime example is using the bench press as a pec builder. Research demonstrates that bench pressing with light to medium loads (<80% of a 1-repetition maximum; 80%1RM) means progressive pectoral engagement when there is an internal focus on doing so, but when loads go above 80% 1RM [corresponding to a load you can lift perhaps 9-10 times(22)], the mind-muscle connection breaks down, even in trained subjects(23, 24). Conversely, internally focusing on engaging a particular muscle in an exercise may reduce **performance**(25) (weight lifted and/or reps performed in our case). But our goal as bodybuilders (not powerlifters) is to use the weight training as a tool to grow more muscle. In other words, “**swallowing your ego**” when lifting is a viable strategy for bringing lagging muscle groups.

For many years, my hamstrings lagged in development behind my quads. A fellow competitor pointed it out to me as a very glaring weakness when others had failed to mention it. (In retrospect, my blindness to the issue was probably partly due to the hamstrings being difficult to see in the gym, even if wearing shorts!) Regarding the overall balance of my physique, this was the primary criticism levied by this fellow competitor (who was an NPC North Americans mixed pairs overall winner). I put this in the forefront of my mind, making hamstrings a mental focus during compound leg exercises and made barbell stiff-legged deadlifts a training staple, working up to sets of 10 with 405lb, touching the bar to the floor with an arched lower back and barely bent knees. My hamstrings grew tremendously over those years and could even be considered better developed than my quads nowadays. On a related note, placing my focus – ensuring mind to muscle connection – towards my lesser developed left quadriceps has also, over the course of many years, allowed me to slowly equalize quadriceps size.

Strategy 2 (Lagging Muscle Groups): Frequency of Training

Let's assume you have mastered the mechanics and mind to muscle connection when training your underdeveloped area... Now what? First of all, patience is virtuous in this case. Train for 4 to 6

weeks and see if you notice a positive difference in the muscle. Does it look bigger, fuller, is it getting stronger, are you perhaps getting sore now whereas you couldn't before?

Once you have derived what you can from training “properly” (and this might take years), it makes sense to consider increasing training frequency (and thus, perhaps, training volume). In this context, be very aware: **Your body doesn't have unlimited recuperative power.** You can't progressively add training volume *ad infinitum* and not expect diminishing returns (or lack of progress entirely).

You can counter this limitation by **Option 1.)** splitting your training volume over two workouts and/or **Option 2.)** training more frequently with greater total volume for the lagging muscle group, but training your strongest areas with lower volume and/or frequency (roughly keeping training volume within your recovery abilities).

Option 1 is an easy sell: Increasing training frequency, in general, makes sense simply because the increase in muscle protein synthesis postexercise is short-lived, lasting less than a couple days (26-28). This likely explains why training at least twice(29), and perhaps 3 times per week (or more) is optimal for producing muscle growth(30-33).

Option 2 is a tougher strategy to adopt for many. Our outstanding muscle groups are typically the ones we love to train. Employing Option 2 would mean that someone who has, let's say a massive back, but needs more leg size might train legs twice a week, but only train back once every two weeks, simply because leg training can require so much recovery resources. Sure, you might lose some fullness in your back with this strategy, likely due to glycogen loss(34), as well some (minimal) loss of muscle tissue(35, 36) and strength(37), but these adaptations would likely come back quickly(36, 38). And this is how it pans out in the trenches: When you come back to training your strong parts, regrowth is rapid. These muscle groups are your strong ones for reasons, be it your natural biomechanical knack for stimulating growth in that area, superior ability to activate these fibers, or even innate satellite responsiveness(39, 40) and cell count, which may persist for years after the cessation of training(38, 41, 42). It's not unheard to train a superior muscle group only once per month to open up training time and recovery resources to improve weaker muscle groups.

Other Strategy (Lagging Muscle Groups): Change the Workout - Exercise Sequencing (Order of Operations) and (Daily) Undulating Periodization

When it comes to exercise sequencing, the most common

patterns may not serve you and your physique. To further prioritize weak muscle groups, they should most often be trained earlier, if not first, in your workout. (If you feel most focused later in your workout, that may be the best time **for you** to train lagging muscle groups.) For example, the classic strategy of adding a few half-hearted sets of leg curls at the end of the workout won't do much for bringing up lagging hamstrings if training quality is sub-par. There are two primary strategies to employ here:

■ **Train weak areas first (or when you feel best).**

Doing so means so you'll be fully mentally focused and can fine-tune your biomechanics and execution (see above).

■ **Pre-Fatigue.** If your exercise execution is not an issue, and you are quite skilled at training, pre-fatigue your weak muscle group by performing isolation exercises for a given muscle before compound exercises (e.g., do a pec fly before a chest press).

Naturally, pre-fatiguing with an isolation exercise will mean that your gym performance suffers on the compound movement, but this is to be expected(43) and suggests that you have indeed created a "weak link" out of the muscle you've pre-fatigued. [NOTE: Some research suggests that there is lower electrical (EMG) activity in a pre-fatigued muscle during a compound movement performed afterward. This has been interpreted as a reduction in one's ability to activate and thus generate a training stimulus in the pre-fatigued muscle (44-46). However, reduced electrical activity is exactly what one would expect in fatigued muscle even when maximally activated(47, 48). So, I take this the reduced performance and EMG data to suggest (as most can sense when training this way) that pre-fatiguing is indeed an effective way to shift the relative stresses of compound exercise on to the pre-fatigued muscle.]

Undulating periodization refers to a "back and forth" variation (periodization) in the training style, stimulus, and/or methodology over time. (Typically training volume and intensity are varied, but of course, frequency can also be manipulated, as well.) Undulating periodization (49) is often contrasted with "traditional" linear periodization(50), where a trainee progresses from one training style to another over the course of a training (meso)cycle. Daily undulating periodization (DUP), in the context of bodybuilding, could simply mean varying the rep range employed on a workout-by-workout (daily) basis. (The parallel approach applied as weekly or monthly undulation would mean sticking with a rep range/training strategy for a week or month at a time, respectively.)

The research to date comparing DUP with more traditional forms of periodization is mixed(50)but demonstrates that there is potential for DUP to improve adaptation(51-55). You could apply a DUP approach to the whole body (as with **Fortitude Training®** – see below) or, in this context, only to the weak muscle groups. Simply including sets in a **rep range you are not accustomed to** – as this will create novelty of stimulus – can promote renewed muscle growth.

Additionally, the plethora of "intensification techniques" such as drop sets (56, 57), forced reps and other “old school training techniques” employed by my friend John Meadows in **Mountain Dog Training** can be used(58).

As an example of DUP applied to an entire training program, **Fortitude Training®** (FT) employs DUP by calling for different Set Types to be performed. Underlying this approach is that each of these Set Types **exploits the different mechanisms and training variables that are important for muscle growth**(59-61). (The trainee can also customize FT to suit his/her preference for the loading of heavier sets or the volume and **metabolic stress** of using lighter loads as a means of creating muscle growth).

The **Fortitude Training® Set Types** are:

- (Heavy) **Loading Sets**, meant to exploit mechanical tension(59). Reps are generally between 6-12(62).
- **Pump Sets**: ~20-30 rep sets performed in various ways (chosen by the trainee) to create metabolic stress (and the resulting pump), both suspected to be important stimuli for muscle growth(60, 61).
- **Muscle Rounds** are cluster sets (discontinuous or intermittent sets) that allow one to accumulate a higher volume of (muscular) training (63, 64) with a given load, while minimizing the systemic (neurological) stress of multiple muscular failure points.

Over the course of a week's training in FT, all three set types are undulated (one set type/muscle group for a given workout but different Set Types on different training days), such that most muscle groups are trained directly three times with FT (or even 4 times in the Turbo Version), but with three different Set Type Stimuli. This, plus exercise variation makes for an enjoyable training style that is also nested in the tried and tested rigor of progressive overload. (See www.fortitudetraining.net for more info.)

Other Strategy (Lagging Muscle Groups): Change Training & Dietary Structure to Prioritize Stimulus to and Recovery of the Weak Muscle Group

Lastly, one can structure one's weekly training schedule and dietary structure to **emphasize recovery** and **preparedness** for the workouts where one is training the weak muscle group. Essentially this would mean:

- **Not training** (taking a rest day) and/or **consuming more food** the day **before** the training session for the weak muscle group, to ensure one is fresh and recovered.
- **Not training** the day after training and/or **shifting the (weekly) caloric intake** disproportionately to the post-workout period **after training** the weak muscle group. This could include having one's “cheat meal” on this day (see [Section 4.5](#)).
- Training **only the weak muscle** in a given workout.
- **Some combination** of the above strategies.

Putting this all together, here is a simple example of a 5 day/ week training program (three-way split into Leg, Pull, Push) for someone who wants to bring up **legs**. This could be done by adding leg training to the Pull and Push days (frequency), varying rep ranges (variety) **and** ensuring **days off before and after** the main Leg training day (with **greater kcal the day after** this training session). Note, too, that training volume has been reduced slightly for upper body training sessions, to accommodate the extra training sessions for legs.

Day	Quads	Hams	Calves	Push (Chest, Delts, Tri)	Pull (Back, Bis, Abs)
1 - LEGS	Heavy Compound Exercises		√	-	-
2 - Rest	Rest day: Consume 500 extra kcal over first three meals of the day				
3 - Hams/PULL	-	Lighter, Isolation Ex; 1/2 Volume of Day 1	-	-	PULL (slightly reduced volume)
4 – Quads/PUSH	Lighter, Isolation Ex; 1/2 Volume of Day 1	-	√ (high reps)	PUSH (slightly reduced volume)	-
5 - Rest	Rest day – Regular Rest Day Caloric Intake				
REPEAT Starting with Day 1					

Table 4: Training Split Modifications Example for Improving Leg Development.

COMMON GOAL #3: Better Presentation (Posing): Practice, Practice, Practice.

Below are some of the most important things to consider regarding presentation (posing). A concrete goal you can set out to achieve regarding posing could easily be to set out a posing schedule and gain feedback from a coach, such as:

“I want to become a better poser in both the mandatory poses and my routine. To this end, I’ll practice all mandatories twice over after each training session during the Off-Season, with feedback from my training partner (an expert poser). I will also hire a coach to create a posing routine during the first 3 weeks of the Pre-Contest period, which I will then practice daily, with weekly posing coaching, until my first show of the season.”

- The most **common mistake** I see is practicing poor posing thus entrenching poor habit. This can create a massive amount of (unnecessary) work in correcting posing errors. Thus, I recommend you not pose too much in the Off-Season until you know how each pose feels when done correctly, i.e., have been coached properly (see below).
- Partner with an **excellent posing coach** if at all needed, be it a seasoned veteran competitor (who poses well) or someone who works as a posing coach. A good coach should be able to manipulate your body positioning to clearly show you how **you** look your best hitting poses a certain way. When you know how it should look, then you begin to nail practice over and over.
- Note that **transitions** between poses are essential. The judges are always watching.
- **Filming** your posing and especially any sessions with a posing coach can be of great help.



- **Do not pose with a mirror all the time.** Filming and having a second set of critical eyes present will catch errors. A simple trick is also to pose with your eyes closed and only after you've hit and settled into a pose, open your eyes to double check your body positioning (and review video if you are recording).
- Note that poses can be “constructed” from **bottom to top**. Most people will forget to pose with the legs before the upper body, so performing a mental checklist for each pose that starts with the legs can be helpful.
- Performing transitions and setting up your poses by beginning with the legs first can help with the above.
- It's worth mentioning here that many athletes have difficulty “opening up” for lat spreads and/or fully activating muscles (usually asymmetrically) to display separation when posing. To this end, many, such as my friend IFBB Pro [John Meadows](#), have found that myofascial work (e.g., Tui Na, Active Release Technique and Graston) effective when coupled with posing practice, of course. IFBB Pros Natalie Graziano, DPT (Graston) and Derik Farnsworth (ART practitioner) have successfully treated hundreds of physique athletes to this end. (See [Section 7.2 Resources](#) for more info here.)

Pre-Contest Posing – The Posing Session

When you buckle down before a show, here are some tips for getting the most out of your posing practice sessions.

- At a bare minimum, you should start to practice your posing **~12 weeks out** from the first contest of your season. You will slowly increase the time spent doing this as the show comes closer.
- You must also build up your endurance here. If you come out of the gate posing for long periods of time, you will no doubt get tired and start to pose poorly, again reinforcing bad habits. I would rather see someone practice more frequently, but for shorter periods of time, so each pose is hit perfectly, and build up the time he/she holds the poses slowly over the course of 12 weeks.
- Practice after your workouts, but only if/when you can pose well. This will also improve your fatigue resistance and help you to stand out on show day when the judges

run you through the ringer with multiple callouts, en route to your victory.

- Prepare your posing music and routine at least two months before your show. Keep your routine **simple** unless your posing is already excellent.

Because each person's skill level (and natural ability) is different, a black and white daily schedule for Pre-Contest posing preparation is difficult, but here's a rough progression for each session.



- Practice and perfect the **quarter turns and transitions**. These will be the foundation of your posing as you will transition in this way (or similarly) between poses most of the time on stage.
- Practice and perfect each of your **mandatories**, one at a time, beginning with the respective front or back “relaxed” position.
- Once you have done the above, an excellent way to pull all the pieces together is to **run through your quarter turns as well as mandatories**, from start to finish, without stopping (as long as your practice is perfect!), just as you would during a prejudging callout.
- Use a friend to **call out poses in the typical order** (for your division and organization) and ensure you are holding them as long as the judges would want you to or much longer.
- Finally, have a friend call out poses in a **random order**, as a Head Judge might do when making onstage comparisons.
- Practice your routine until you have *almost* lost all

enthusiasm for it, i.e., it is engrained in your head. If you tend to have stage jitters, we want the routine to be second nature by the time you hit the stage. However, be wary of practicing your routine nonchalantly, just going through the motions. Good posing is hard, but should look easy!!!

Chapter 2 – Post-Contest (1-2 Months):

“This too shall pass.” –Persian Adage

Bodybuilding is synonymous with a “lifestyle” for many, meaning it is a continuous pursuit. This doesn’t mean that one might not step away from actively pursuing bodybuilding, and in fact, not doing so now and again can be counterproductive. The Post-Contest Period, right after your (last) contest of the season has ended, is the time when one can step back and consider the next best course of action (in the Big Picture). To be your own coach, one must learn to think logically to some degree when passionately pursuing your bodybuilding goals. Here are some considerations when it comes to mapping out your Post-Contest strategy.

Post-Contest Advantages

- **You will be very lean**, meaning that even with the expected body fat that comes with adding muscle mass, you will still have a lean physique, which can make training very fun and motivating. This is advantageous as well because the leaner you are, the easier it is to tell how your muscularity is changing.
- You may find that your **strength levels increase** rapidly upon adding more food into your diet post-contest. Greater strength in the gym means a better training stimulus for muscle growth(65, 66).
- You might be coming off a very low calorie diet, so **creating a caloric surplus** with which to **grow** will be quite **easy** (but see below) as you'll be quite hungry.
- **Insulin sensitivity** is high: You will have the ability to shuttle nutrients into muscle tissue quite well. On the other hand, changes in many other hormones and fat-derived adipokines that drive weight (and fat!) regain will persist as long as you're leaner(67-72). [Still, the details of how leptin, insulin and ghrelin coordinate weight regain after you've dieted down isn't quite clear(72). See the Frequently Asked Question about "metabolic damage" in [Chapter 6](#) for more on this topic.] One thing is certain, though: Resistance exercise will increase skeletal muscle's insulin sensitivity(73) and turn on the hypertrophy process(74), so training (not just eating) is important if you want extra calories to be put to good use!

Post-Contest Disadvantages

- You might be **overtrained** or nonfunctionally overreached, and thus not be terribly motivated to train and in a physiological state where a break from training is warranted (see [Chapter 2 Special Section](#) below on Overtraining).
- You may have the tendency to want to **overeat**.
- Your **joints** might not feel their all-time best.
- You may even have an existing **injury** (or more than one) that requires (medical) attention. Your intuition may be telling you to lay off or suffer a muscle tear or strain or another injury.
- You might be **dehydrated** immediately after the show, or very **bloated** and edematous from a day or two of post-show binging. You might have some electrolyte irregularities from diuretic use (which I am not in favor of).
- **Family and friends** might need some extra time with you to re-establish interpersonal connection if you isolated yourself during your contest preparations. You won't want to "live in the gym" anymore, simply for the reason that you want more time with the special people in your life.
- You might even fall into a bit of a **post-show "blues"** where the motivation to train, adhere to a strict diet, *etc.* is lost without the lofty target of a looming show. [This is common and may actually be a psychological "adaptation" of sorts ([75](#)).]
- As I noted above, if you do decide not to continue training immediately Post-Contest, be aware that your propensity to add body fat is high([67-71](#)) when you're dieted down. (See the Frequently Asked Question about "metabolic damage" in [Chapter 6](#) for more on this topic.)

2.1 Post-Contest: To Train or Not to Train?

It's not uncommon to completely discontinue training after a contest: This is very common and warranted in many cases. Depending on the person, this may be a very viable approach. IFBB Legends Ronnie Coleman and Kevin Levrone were renowned for taking this approach, to provide their bodies much needed time to recuperate. (Of course, these men were already as muscularly large as possible and able to rapidly accumulate massive amounts of muscle, making this a viable approach.) My friend John Meadows also takes this approach.

If, due to the Post-Contest Disadvantages listed above, taking a break from training makes sense, I encourage you to do so and also take other measures to ensure your health. This especially includes **keeping your diet in check** to prevent a rapid increase in body fat(67-71), blood pressure, and psychological issues, all of which can result from rapidly losing the contest level conditioning you just worked so hard to obtain.

On the other hand, what if you are an up-and-coming bodybuilder who feels like he/she needs as much time as possible to make gains before the next contest season? Despite the perceived time crunch, this may not be the best call. In the [Special Section at the end of this Chapter](#), I cover the related phenomena of overreaching and overtraining, both crucial considerations post-contest, as well as how to assess your own recovery status. You might like to read this [Section](#) on Post-Contest “rebounding” before reading on here.

Post-Contest Training And Diet: Making the Call!

The **Post-Contest Period Readiness Checklist** below is a simple guide to help you think through **your situation** in terms of training, diet and balancing your life with competition ambition. ([See Below](#) for the Perceived Recovery Status Scale.) **Feel free to add to this checklist** – personalize it based on your own set of priorities.

The checklist derives a (weighted) tally of the basic items in your favor for continuing focused bodybuilding Post-Contest (positive scores) versus considerations for scaling back your focus on diet, training and bodybuilding (negative scores). **This is not a scientifically validated checklist**, but one I hope might help you think objectively Post-Contest when it's easy to feel a bit “lost.”

To use the checklist, look at each item in the left-most

column (e.g., Perceived Recovery Status Score), consider which of the three options best fits you, and then note the associated score (in the colored boxes). I've grouped the responses into those that are "good" (positive scores), typical for most post contest (neutral or negative scores) and "not so good" responses (negative scores).

The scores for all 6 items can thus be tallied. **Positive total scores** suggest readiness to pursue Post-Contest training and diet with vigor, whereas a **negative total score** suggests you should closely address those items where you scored poorly. (Naturally, any negative scores deserve attention, even if you have an overall positive score!)

Post-Contest Period Readiness Checklist				
	Good	Typical	No So Good	Your Score
Perceived Recovery Status Score	PRSS = 7-10 +2	PRSS = 4 - 6 0	PRSS = 0 - 3 -2	
Joint, Tendon, Etc. Pain?	None 0	Moderate -2	Extreme -3	
Injury Status?	None +1	One - Two (mild) (-1) x Injury Count	Several	
Relationship / Personal?	Intact +2	OK 0	Shakey -2	
Water Balance is Normal	Yes +1	Kind of 0	No -2	
Appetite Controlled	Yes +1	Kind of 0	No -2	
			Your Total:	

Table 5: Post-Contest Readiness Checklist. (See text above for tallying score).

Combating Post-Contest Blues

The readiness checklist above presumes that you are motivated to train, i.e., that you want to jump back into the saddle and train again. As I noted above, post-contest blues are not uncommon once the high of the contest is over. Without an immediate and pending goal to shoot for, one's diet can fall to pieces [meaning more **junk food which can be depressive unto itself(76)**]. Extreme water retention and the re-gain of body fat can be a difficult challenge, especially in those who have body dysmorphic tendencies, as do many bodybuilders (77-80), making training less fun (and even uncomfortable if water retention is causing low back pain, for instance). Here are a few thoughts to help you get past the post-contest blues. **NOTE that the below is not, nor is it a substitute for medical advice.** If you are in need of **professional help**, please seek it out!

- A good bodybuilding coach will recognize that **after**

the show may be when a client needs the most help.

You should do the same for yourself if you are your own coach.

- **Recognize** that you might be undergoing something similar to the **abstinence violation effect**(81-83) if you've "fallen off the wagon" as far as training and diet. This is a common psychological phenomenon whereby a lapse in behavior (not following a strict diet and Pre-Contest training plan) can evoke guilt and a perceived loss of control that leads to completely giving up previous behaviors [or "relapsing" into old behavior patterns(83)].
- Acknowledging the above cognitive phenomenon if it happens and know that **each day is a new opportunity to “get back on the horse.”** You have the choice to not feel guilty and to reclaim control.
- Know that it is **heal thy** and **desirable** to **re-gain** some **body fat** after a show. (I have repeatedly found that I feel physically much better after putting on at least a few pounds of body fat during the first couple of weeks post-show, i.e., getting out of the "Danger Zone" where injury risk and training motivation/energy is more normal. See [Section 2.2 Dietary Guideposts](#) below for more on this.)
- **Remind yourself** that there is a **victory in every effort to compete**, even if you fell short of your physique and/or placing goals. Sometimes the life lessons gained from failure more valuable than anything gained from what most would call a “victory.”
- **List out specifically** all the accomplishments that happened along the way in the past year or longer period of time up until your most recent competition. **Pat yourself on the back!!!**
- **Re-establish (new) goals** using the Personal Bodybuilding Inventory (see [Section 1.1](#) above). You may even need to set flexible short-term goals(84) (day by day, or week by week) that can help you be proactive through the post-contest blues.

Let's assume now that you've made the decision to **train post-contest**. Below are two scenarios to give you an idea of how you might set up your personal approach. Regardless of your overall state

of recovery, **appropriate attentiveness to any nagging injuries, arthritis, tendonitis, etc.** that you may have trained through during your contest preparation is paramount.

SCENARIO: Overreaching is a Real Consideration (& Negative Post-Contest Recovery Readiness Scores):

- If you train with a higher volume type routine, like MountainDog Training, you would train with a higher volume, but lower "intensity:" Lighten the loads, don't take sets as close to failure as you typically would, and don't employ intensification techniques (like drop sets, forced reps, etc.). You may choose to train with about the same number of sets as you otherwise would, but not if this risks digging an even deeper hole towards overtraining. Training 4 to 5 days per week would make sense here.
- If you use a higher frequency type of routine, like Fortitude Training® (or a MountainDog plan that's frequency oriented), you would reduce training volume and employ the program's deloading procedure (in Fortitude Training®, the "Intensive Cruise"). Thereafter, you could work your way into a full-blown training cycle, increasing volume as recovery permits.
- **However**, if real overtraining is an issue here, then avoid that at all costs: Reduce training intensity (loads and effort level), and volume, as well as frequency.

SCENARIO: You Feel Recovered, Healthy & Motivated Post-Contest

- You may find, I often have, that you feel ready (and are motivated) to jump back into the fray in the gym Post-Contest. (Both a very good and a bad showing can be highly motivating.)
- Don't throw caution to the wind, of course, but I believe that this can be an excellent opportunity to regain any lost muscle size in the next 4-6 weeks. (See the [Section 2.2](#) below on Harnessing the Rebound.)
- Training would be **intuitive** here, beginning with the suggestions above and working towards full-tilt training (intensity and/or volume) as your body and mind allow.
- Your training program should be enjoyable but ideally,

one you know is **effective** for you (e.g., based on what you've done previously) or one you plan to try during the up-coming Off-Season. The Post-Contest Period can be a great time to **experiment** with new training splits, techniques, exercises, *etc.* that you would like to implement in the coming year. On the other hand, if you are dead-set on making as much progress as possible during the post-contest period, you should use the approach you already strongly suspect is **optimal** and simply "put the pedal to the metal."

- Still, **a break will be needed eventually** by almost everyone, typically 4-6 weeks after training. You might temporarily get a little smaller and softer, but this break is going to recharge you mentally and physically! During this time, I encourage everyone to not even step foot in the gym for at least a week or more: Enjoy yourself and do things you love, with loved ones. The gym will be there when you finish your break. Once you start back, you will easily surpass where you were prior to the break. That is when you officially enter the "Off-Season."

ANOTHER POSSIBLE REAL LIFE SCENARIO: You Feel Recovered and Healthy, but DON'T Want to Train Post-Contest

- You've got the post-competition blues (**see above**). You may run the risk of diminishing your love of training and/or bodybuilding by forcing yourself to train. Although we may feel like one during contest preparation, we are not "machines" and sometimes just need to explore our other interests. (This is normal and not a sign of weakness, but rather an indicator that you wisely sense the bigger picture.) Even if you have an impending contest, forcing yourself to train "against your will" can even result in a worse outcome compared to simply taking a week or two off. Bodybuilding will be waiting upon your return.

2.2 Post-Contest Diet & Training: Harnessing the Rebound?

Ah, the Holy Grail of bodybuilding: The coveted, oft bragged about Post-Contest "Rebound." Unfortunately, unbelievable bodyweight gains are often paralleled by extraordinary discomfort due to water retention. The result may include elevated blood pressure, pitting edema (especially in the lower leg, aka "cankles") and/or "moon face," all suggestive of a disruption of normal fluid homeostasis (85). Even graver risks may present themselves when pharmaceutical diuretics have perturbed your physiology(86, 87).

Important Post-Contest Considerations

From a practical standpoint, I believe a good coach (you!) should recognize the following about the post-contest Period:

- The transitioning from your Pre-Contest regimen to the post-contest period can be psychologically more difficult than dieting down for your contest(s)(7). A good coach plans for this several weeks **before** the contest: Post-contest care is as crucial for your well-being as safely preparing for the contest itself.
- Maintaining your best stage-level body fat percentages is **dietarily incompatible with gaining muscle**. Indeed, being extraordinarily lean is associated with a hormonal state far from ideal for gaining muscle mass(7).
- The behavior needed to maintain ultra-low body fat levels is very likely **not psychologically healthy**(88). Similarly, if you've been exceptionally lean before at the tail end of a grueling diet, you have probably noticed you don't have the same sense of wellness you may have otherwise (i.e., you "suffer," or at least find it uncomfortable to be in this state on a daily basis).
- You can **only gain muscle mass so quickly** post-contest, and at some point, if massively overfeeding (overeating), glycogen stores fill up and excess calories are stored as body fat (89).
- On a related note, your muscle glycogen levels, and the associated intracellular water(90) were ideally elevated

(from carbing up) when you were on stage. Thus, increases in body weight immediately post-contest should mainly reflect (extracellular) body water you lost when "drying out" before competing. In other words, in the few days post-contest, it's normal to return to the body weight you were at before dropping water for your contest. Any weight beyond that is likely (subcutaneous) water retention, possibly overconsuming salty foods and/or a "rebound" from (over)use of pharmaceutical diuretics.

Post-Contest Dietary Guideposts

Here are some guideposts to help you navigate your Post-Contest dietary strategy. Note that each person's approach will be a bit different [just as physiology(91) and Pre-Contest strategies vary], so close monitoring is essential for keeping you healthy and on a productive physique-improving path. **Also keep each these considerations in mind concomitantly** (they are **not** "steps"): You'll be juggling diet, supplementation and all the other aspects of your life (bodybuilding related and otherwise) all at the same time.

■ **Consideration #1 – Your Relationship with Food.**

Be conscious of your relationship with food. Fully addressing this issue is far beyond the scope of this book, but it likely comes as no surprise to you that bodybuilders and gym rats tend to have clinically disordered eating (88, 92, 93). [Please consult an appropriate professional if you fear this is the case for you.]

■ **Consideration #2 – Reverse Diet Strategy.** Because your ability to gain fat rapidly is increased post-contest(67-71), I suggest a **slow return to normalcy** via some form of a "**reverse diet**" which can be employed at least a couple different ways:

- **Reverse Diet Method #1:** Focus your additional calories and carbohydrate peri-workout (during a peri-workout recovery supplement drink and meals post-workout), when insulin sensitivity is highest. By doing this, you can satisfy normal urges for more substantial meals, which opens up possibilities of social outings where food is plentiful. Additionally, this simple strategy is a way to maintain a

semblance of order, which can be a psychologically healthy intermediate step as opposed to completely abandoning the structured lifestyle demanded by the Pre-Contest period.

- **Reverse Diet Method #2:** Use dietary records as a guide to engineer a reverse diet by adding food in roughly the same sequence you removed it when dieting down. You can base this on time as well as on body composition (going backward using the data from your journal/weekly checkins), and adjust as needed to gradually increase your body weight.

■ **Consideration #3 – Taper Fat Loss Strategies:** Gradually taper off your fat loss-supplements, as well as cardio in accordance with how they interact with the above guideposts, and how fast you are (re-)gaining weight and changing body composition post-contest. The basic strategy here is to spend the next ~6 weeks shifting both cardio and supplements towards the strategy you plan to employ during your Off-Season. (For more on the inclusion of Cardio in the Off-Season, see the [Chapter 3 – Special Section](#) on Cardio in the Off-Season.)

■ **Consideration #4 – Protein is the Safest Post-Contest Macronutrient:** As discussed in [Chapter 3.2 below](#), protein is the most thermogenic of all the macronutrients. For example, merely adding protein to the diet prevents weight regain when the goal is maintaining weight loss (94), probably because of the effects on satiety (especially casein protein)(95-97). Similarly, when the goal is gaining muscle mass, taking in very high dietary protein levels (to the tune of as much as 4.4g/kg or as much as 500g/day for some of you reading this) does not increase body fat(98).

■ **Consideration #5 – Get Out of The Ultra-low Body Fat “Danger Zone:”** Personal and corroborating experiences from other bodybuilders (friends and those I’ve coached) makes it quite clear that the ultra-dieted down state that comes with being truly “stage ready” means a high risk of injury too and often much general malaise to effectively train for bodybuilding gains. That being said, it makes sense to be sure to replenish fluid and increase body fat (and improve mood/fatigue) to

get out of the “Danger Zone” (roughly about 5-10lb from contest weight) relatively rapidly. This is not a license to pack on 20-30lb the first 72hr post-contest. Instead, planning for and allowing oneself to gain a bit of body fat and psychological (and physiological) energy in the first week or two post-contest is a sensible and healthy strategy to for a productive post-contest period. (NOTE: See [Section 2.1](#) regarding the decision to train or not to train Post-Contest.)

Is There a “Magical” Rebound Effect Post-Contest?

Generally speaking, the time it takes post-contest to return to your Pre-Contest body weight would depend upon the factors listed below. A notable exception here could be if someone started contest preparation extraordinarily overweight or obese or simply with too much body fat, and returning to that weight would be unhealthy/unwise.

- **The duration of your diet.** Post-contest weight gain is most often more rapid than Pre-Contest weight loss. **As a rule of thumb**, the time return to your Pre-Contest body weight should be **no shorter than roughly half your Pre-Contest (diet) period, and preferably longer** (e.g., if using a reverse dieting strategy per the above). [For example, if it took you 12 weeks to diet down from 220 to 198, then it might be reasonable to return to this weight in no less than 5-7 weeks.]
- **How much weight you lost during the Pre-Contest period.** The time to return to pre-dieting body weight would general vary inversely with how much weight you lost. In other words, the less weight you lost (assuming you were "in shape" on stage), the faster you might regain that weight, whereas the more weight you lost, the slower the regain would be. Naturally, this rule only applies within certain limits of body weight/body fat: It's not a license to regain weight to an Off-Season weight where body fat is unreasonably high, especially if your previous Off-Season body fat was too high. (Sometimes it takes a grueling prep or two to learn to avoid this scenario.) Also, losing a lot of body weight (e.g., >30lb) during your prep may mean you over-dieted, losing an inordinate amount of muscle mass. (See the [Pre-Contest Weekly Fat Loss Table](#) in

[Section 1.3](#) on Goal Setting to get a realistic idea of fat loss during prep relative to your Off-Season starting point.) In an "over-dieted" situation, where muscle was lost, the myocellular mechanism of muscle memory [involving satellite cells (42) and epigenetics (38)] may allow relatively rapid (re)gain of skeletal muscle mass just by gradually increasing caloric (and protein) intake.

So the question remains: **Is it possible** to have a **magical post-contest rebound** effect that slingshots your progress as a bodybuilder, or at least means you end up returning to a given Off-Season weight but with a better composition (percent body fat) than you had Pre-Contest? Alternatively, is the post-contest periods essentially a transition to the Off-Season where the real gains are made? Well, my answer to that is (as with many things), "It depends:"

The “Magical Post-Contest Rebound”

The magical rebound **might occur** when:

- Your **diet, training and/or supplementation are in better order** (or superior in some way) than during the Off-Season.
- You are **still generally gaining muscle** (e.g., you have only been competing and training for several years) and still making good headway towards your muscular potential.
- As noted above, your Pre-Contest diet was abrupt (perhaps a **“crash” diet**) whereby you lost muscle that you’d otherwise not have lost with a slower and steadier approach.
- Some combination of the above.

For those who strategically employ a greater degree of supplementation and/or use of bodybuilding pharmaceuticals Pre-Contest and follow a much more bodybuilding-friendly diet (vs. Off-Season), and then maintain this regimen after the show, it would seem very likely that muscle size and/or body composition might end up improved post-contest. Also, one should **take into consideration**, in addition to the restoration of water, glycogen(99) and (gasp!) body fat, that, for example, gaining (or restoring) just 5lb of muscle during a 2 month period **would** translate into an **extraordinary** 30lb muscular gain over the course of a year. This rate of muscle gain might **seem magical** especially to someone who typically gains this much muscle over the course of a year, but this might just be a rapid restoration of muscle mass lost during the Pre-Contest (38, 42). Still, I

suggest resisting the urge to go all out dietarily and gain weight at a faster rate: Gaining too fast would likely mean gaining unnecessary body fat (89). Indeed, regaining lost muscle (not just body fat) plays a role in restoring your appetite to normal levels, so rapidly regaining fat before you have re-acquired any lost muscle mass may leave you with a ravenous appetite and in the precarious position of poor body composition and a physiological desire to worsen it (68).

Post-Contest Scenario EXAMPLES

The post-contest period can be very tumultuous, even compared to a Pre-Contest (where a specific goal and contest date(s) create a center of focus that helps keep on on track), and thus highly variable among bodybuilders. Thus, rather than outline an ideal week by week dietary, training, supplementation, *etc.* adjustments in a single example, I've put forth three different scenarios below in hopes you'll be able to glean a strategy to fit your unique situation.

In addition to the [dietary guideposts noted above](#), also refer to the Off-Season guiding dietary principles outlined in Chapter 3.3. Note that the post-contest period differs from the Off-Season in that post-contest, there is a focus on returning to normalcy and restoration of health. Merely adding back food into one's diet and ensuring more rest will make for an anabolic environment Post-Contest such that recovery of muscle lost during the Pre-Contest diet is likely (41, 42, 100), but don't forget that adding fat too rapidly can also occur(67-71). On the other hand, with the contest rigors in the rearview mirror, the Off-Season juggling act shifts towards balancing gains in new muscle mass while limiting gains in body fat. (See the discussion in [Section 1.3 – Goal Setting](#) for more about the goal of moving of a weight class.)

Less Than Ideal: Post-Contest Melancholy

George dieted down from an Off-Season weight of 220lb (100kg) to compete at the top of the middleweight class at 176lb (80kg). He did an extraordinary amount of cardio (up to 120min/day) on top of 6 high volume gym sessions (twice on some days when he needed to split the workouts up), spending 4-5hr in the gym on some days. He followed a generally ketogenic diet (sometimes even eliminating fat intake) and used more "fat burner" supplements than ever. Distraught at his placing and appearance onstage, George took it upon himself to "decimate" each and every all-you-can-eat buffet in his local area so he could get bigger as soon as possible. The water retention, fatigue and lack of appetite-suppressing effects from

abruptly eliminating (rather than tapering off) his fat-burners left him virtually unable to train and constantly hungry. His bloated appearance only amplified his melancholy and within 5 weeks, his weight was nearly back to the 220lb Pre-Contest starting point, but with more fat and less muscle than when he started his diet. Had George, his coach and/or his friends firmly planted a seed of thought weeks before his contest that these events might happen, and that easing back into training (and tapering off of his Pre-Contest supplements) would make sense after his show, George might not have ended up in this unfortunate situation. After gathering himself together, George decided to slowly diet back slowly to about 200lb before officially starting his Off-Season.

Well Played: An Excellent Post-Contest Plan

Jenny dieted down for her Figure competitions over the course of 16 weeks, reducing her bodyweight by only 14 pounds while using **Fortitude Training®**. She added high-intensity interval training 3 times per week during the last month and a half and made sure to take one day/week off her fat-burning stack (drinking only green tea those days). Her post-contest plan was to have as much fun in the gym as possible: She switched to the Intensive Cruise style Fortitude Training® workouts (intuitive selection of exercises that kept things fun and fresh in the gym), weight trained thrice per week, and kept up a cardio regimen by joining friends for "cardio-pump" classes (glute oriented, of course) 3 times per week as well. She employed a reverse dieting approach (guided by body weight) and went to her favorite sushi restaurant on the weekends for a night out "cheat meal" after training. Fat burners were tapered down to just green tea over the 4 weeks post contest. Six weeks after her last show, her weight was 3-4 lb less than before starting her diet, but she was stronger in the gym on most of her core lifts, and skinfolds suggested carrying just as much muscle mass than before her Pre-Contest diet. At the 6 week mark, she took an active week-long outdoor camping vacation hiking the local mountains with her dogs on a daily basis. She then started her Off-Season quest for more capped delts, back width and glute roundness using a Fortitude Training® inspired program.

Magical Muscle: A Rebound Phenomenon

Bill had been "slacking" in his training for the past couple of years, so he decided to take on the challenge from his training partner and compete in a local show 12 weeks later. He dropped 35lb, landing him as a decently competitive light-heavyweight. With newfound vigor post-contest, Bill decided to set his sights on a regional

level (national qualifying) competition 6 months later that he had placed well in nearly a decade before. With this in mind and after a few satisfying meals with friends, Bill was back in the gym the week after the show, training with higher reps for the next two weeks. He also slowly tapered his fat-burning supplements and transitioned to a somewhat reduced supplementation plan during these two weeks. Thereafter, Bill started



Mountain Dog Training, employing a peri-workout nutrient timing approach to gradually increase his body mass. [It quickly evident from his training logs that he was stronger than before starting his contest prep just a month post-contest.] At the end of his 12-week MountainDog Training cycle, his weight was 5 lb over his Pre-Contest starting point, but body-fat caliper measurements and the mirror suggested he was only about 6 weeks out from being stage-ready at that time. Because of Bill's Pre-Contest starting point (in terms of training, diet and supplementation), enthusiasm and smart strategy, he essentially manifested the post-contest "holy grail" – he rebounded past pre-diet levels of muscle mass but at a lower level of body fat.

Chapter 2 SPECIAL SECTION: Overtraining or Overreaching?... How Far to Push the Envelope

Overtraining (OT) is the process of increasing or maintaining a heavy training load (intensity and/or volume) to the extent that eventually leads to overtraining syndrome (OTS). OTS is characterized by a degradation of performance (strength loss in the gym) **from which one does not recover for many weeks or even months**(101-103) **Overreaching** (OR), on the other hand, is an intentional increase or maintenance of a heavy training load to create a short-term decline in performance, with the intention of producing a supercompensation effect, i.e., improved performance (101). In the case of a bodybuilder, this supercompensation (you might have heard me call this a "rebound" in the past) would mean adding muscle mass at a remarkably rapid rate. Somewhere in between (**functional**) overreaching (that produces supercompensation) and outright overtraining is the phenomenon of “**nonfunctional**” overreaching. When overreaching is nonfunctional, the athlete recovers from a substantial performance decrement relatively quickly, but harnesses no beneficial rebound(101).

At the crux of phenomena of OR and OT is insufficient recovery, and it's important to note that both training load and non-training stresses can contribute to a long-term imbalance your ability to recover. Functional overreaching (what we're looking for if planning to do so) can be conceptualized (see Figures below) as a strategic, short-term excess of training stressor that, when removed, slingshots adaptation positively. In other words, during the "rebound" following a successful functional OR period, recovery outweighs training stress, and adaptation is accelerated: Muscle growth (and strength gains) occur. The rebound effect that some bodybuilders get after a competition suggests they are enjoying an overreaching effect (and were thus not overtrained, technically speaking).

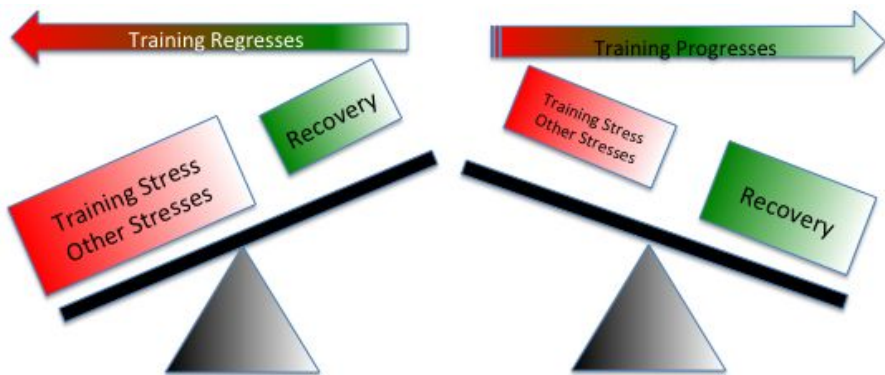


Figure 3: Balance of Training Stress vs. Recovery on Progress.
(Left side depicts Overtraining.)

It's important to note that there is a relative dearth of research in the realm of overtraining due to **resistance exercise**. It seems that loss of strength may be the very last indicator that one has passed over into the realm of overtraining(101), i.e., that once one has started to lose strength, it's too late. As you might expect, resistance exercise OT diminishes sympathetic nervous system effectiveness, because of reduced catecholamine (e.g., adrenaline) **sensitivity**, not due to an inability to elevate the fight or flight hormones(104-107), as is the case with endurance exercise OT(101).

Typical Signs and Symptoms of Overtraining and Overreaching

Overtraining is a complex phenomenon. It may manifest as a multitude of adverse effects on the central and autonomic nervous systems, and endocrine system, not to mention skeletal muscle itself. Scientists have tried to unravel a complicated scenario of neurotransmitter, hormonal and psychological sources of fatigue, that, most typically, leave the overtrained athlete feeling lethargic, apathetic, and moody(103). This is obviously not what we are ultimately striving for. Note here that extreme bodybuilding where one is pushing the limits of musculoskeletal and gastrointestinal capacities, possibly in combination with drug use (e.g., anabolic-androgenic steroids), can produce a unique set of stresses leading to the overall systemic overload that brings on OTS.

Here are some simple questions you can use to check in with what may be an obvious (albeit denied) fact that you could be nearing a state of overtraining:

- Are you injured?

- How many shows have you done?
- Are your relationships intact?
- How do you feel, generally speaking, throughout an average day?

Beyond these, some more specific signs and symptoms may also present themselves when OR and OT manifest.

Typical Signs of Overreaching

- Loss of "pop" when training(103). Weights that usually are lifted with a clean, crisp motion now seem to take a little too long to execute the rep. Your limit strength may decrease, or your tolerance for overall volume may decline.
- Difficulty in elevating your heart rate (108)
- Feeling of simultaneous tightness and stiffness(109). You may also experience discomfort in your tendons(110) on the first few eccentric motions of any set.
- Delayed onset muscle and tendon soreness(109) that persists, even after low volume or low intensity training. This could be accompanied by a somatic sense of being heavy(111).
- Changes in appetite(110) and a decrease in body weight (111).
- Mental fuzziness and loss of focus during training(110).

Here some the perhaps more severe symptoms that I think reflect an actual state of **overtraining**.

Typical Signs Suggestive of Overtraining

- All of the above symptoms of overreaching, potentially increased in severity(112).
- Loss of motivation in and outside of the gym(110).
- General loss of focus(110).
- Sleep disturbances(109).
- Mood-related issues or general irritability (109, 110)
- Persistent feeling of fatigue(110).

Is There an Overtraining/Overreaching Meter?

So, aside from running down the checklist of signs and symptoms of OR/OT, are there diagnostic tests that we, as bodybuilders, can employ? While scientists haven't developed an "OT-meter" that keeps everyone from overdoing it (101), research does tell us that there are typically enough clues when screening an athlete on an **individual**, case-by-case basis(113). You should be smiling right now because this means learning what works (and doesn't work) for you is quintessential to being your own bodybuilding coach. (You only have your own predicament to untangle.)

Various **research** measures have been used to monitor/assess OT: Metabolic testing, such as lactate levels during exercise; hormones including adrenocortical and sex hormones, and other hormones such as adiponectin, leptin and ghrelin; laboratory performance measurements; and clinical tests of psychological state and reaction/attention tests. The list is extensive(101), but mostly unavailable or impractical to employ on a regular basis, and thus not useful to your average bodybuilder training in your average gym.

However, there are some basic "tools" you might consider adding to your bodybuilding toolbox to monitor your recovery status. Some of these you may already be utilizing, but not taking full advantage of:

Your Log Book and Quality of Your Training Sessions.

Most modern bodybuilding competitions aren't based on gym or lifting platform performance, but strength in the gym is an obvious indicator of how well you're recovering from training (and other stresses). Performance (weight x reps) on your own core, "go to" heavy compound exercises (barbell presses, squats, rows, etc.) can be telling of your training status(105). If your **strength** is reduced at a particular body weight (keeping body composition in mind), this can suggest you need a break. Also, the rate of progression or **regression** is an obvious sign.

Hormonally, resistance training-induced overtraining paints an interesting picture: the overtrained bodybuilder's ability to elevate cortisol may be decreased (114), while there are higher levels of adrenaline and noradrenaline (106) which have a lesser effect due to receptor downregulation(107). The short and sweet of this may be that, if you're beginning to overtrain or overreach, activating your

sympathetic nervous system to "get up" for big training days may be a little tougher than usual, and **things just feel more difficult** when it's "go time" in the gym(115).

Motivation to Train: Perceived Recovery Status Scale.

As I mentioned above, the seasoned athlete can usually sense when she's ready to train hard, or even if she needs to just skip the gym altogether. Sometimes you might feel like you should take it easy in your exercise selection (e.g., use more single joint isolation movements) and other days you feel ready to go to town with the big lifts like squats and deadlift. **As a rule of thumb**, if you sense that your motivation to train and general health status is declining, i.e., you simply don't feel well from the stress of training, force-feeding and perhaps even toxicity of drug use, then chances are you'll not be making good bodybuilding progress. Don't be a victim of your own ambition. Albeit "common sense," **the ability to auto-regulate in this way can be easily be obscured by drive and determination to progress as a bodybuilder.** Because of the grueling nature of Pre-Contest training, it can be hard to step back during the rest of the year and realize that smarter bodybuilding smarter does not necessarily mean making bodybuilding "harder."

As it turns out, though, **there is a scientifically validated instrument** that can help you fine-tune your knowledge of your recovery status: The **Perceived Recovery Status (PRS) Scale**(116). The PRS Scale was originally developed as a practical perceptual (psychobiological) means of predicting changes in performance during a series of high intensity exercise (sprinting) bouts(116). More importantly for us, a PRS Scale reading correlates inversely with indices of post-resistance exercise muscle damage, and directly with blood testosterone levels when muscle damage is at its greatest(117). Even more impressive is that PRS measures (taken at rest) predict ratings of perceived exertion during resistance exercise: The PRS Scale can help tell you, before you get under the bar, how it's going to feel that day. The PRS scale changes with performance during the days after a tough training session (PRS scores are lower 24 vs. 48 hours later), and this holds true especially for multi-joint exercises (Squat, bench presses, deadlifts, etc.) where, as you likely know, gym strength recovers more slowly compared to single joint (isolation) movements(117).

10	Very well recovered / Highly energetic	Expect Improved Performance
9		
8	Well recovered / Somewhat energetic	
7		Expect Similar Performance
6	Moderately recovered	
5	Adequately recovered	
4	Somewhat recovered	
3		Expect Declined Performance
2	Not well recovered / Somewhat tired	
1		
0	Very poorly recovered / Extremely tired	

Figure 4: Perceived Recovery Status (PRS) Scale(116).

For the above reasons, I include a PRS Scale measurement in a weekly checkin you would do during the course of the year (see [Section 1.2 Weekly Progress Markers](#)).

Heart Rate Variability (HRV)

Another potentially useful marker of training status is the variability in one's heart rate. More specifically, the time between heartbeats can be measured on a beat by beat basis and analyzed statistically to get an indication of heart rate variability (HRV), i.e., the variability in the interbeat (R-R) interval (or the "N-N" interval after abnormal beats have been eliminated from a recording). Short time samples can be evaluated in the “time domain,” that is, analyzed for the variability in the difference in successive beats to yield a result in milliseconds (ms), such as the square root of the mean squared successive differences of R-R intervals (rMSSD) or simply the standard deviation of the NN intervals (SDNN) (118).

Longer HR recordings can be analyzed in the “frequency domain” [in various ways(118) sometimes referred to as a power spectral analysis], where it has been found that heart rate variability (HRV) also fluctuates with different cycle lengths (i.e., with varying frequencies) (119). [Here’s an analogy to help this make more sense. Time domain HRV measures could be likened to measuring the overall flux of light from a star, whereas frequency domain measurements are analogous to analyzing the spectrum of frequencies of light emanating from the star, to provide insight into its chemical reactions and composition (120).] “Ultra” and Very low frequency (slowly changing) effects come about from circadian influences, temperature and fluid regulation which change gradually throughout the day. Low frequency effects (>6s cycle length) are a function of the balance between sympathetic nervous system (fight or flight!) vs. parasympathetic (rest and digest) nerve activity to the heart. Lastly,

high frequency effects (2.5-6s cycle length) are a thought to be primarily a function of parasympathetic (vagal) tone to the heart(119). Thus, HRV can be teased from high-quality heart rate data to get an indication of the state of arousal of the autonomic (autopilot) part of the nervous system(121).



From a health perspective, we can say that generally speaking, greater HRV (higher parasympathetic activity) is favorable(122), indicating a less stressed autonomic nervous system. Interestingly, although one would expect HRV to increase with fitness(121), **HRV does not consistently predict training status** (probably due to **lack of methodological consistency** across studies)(123).

Nonetheless, HRV shows promise as a physiological marker of (over)training status. Naturally, the overreached/overtrained athlete senses this in various ways, including mood and emotions and, indeed, emotions impact HRV as one might expect – positive emotions have a favorable effect and vice versa(124). [Notably, clinical depression is actually similar to OTS in psychological and biological ways (125).]

HRV is predictive of recovery status in other ways, as well. After endurance exercise of higher than normal intensity or duration, HRV is negatively impacted immediately postexercise (126) and at night (without necessarily affecting sleep quality)(127). The more trained one is, the lesser the impact on HRV, but with sufficient duration and intensity, the autonomic nervous systems of even the most trained endurance athletes are impacted (128). Similarly, HRV tracks with the day to day stresses of changing training load and competition(129).

The use of HRV in the context of overtraining and autoregulation of training is a blossoming, but young science(130), and all the kinks have not been worked out when it comes to using HRV in the context of bodybuilding. Due to the central importance of the cardiovascular system during endurance exercise, the vast majority of HRV and exercise performance research has studied endurance athletes. A study of athletes of mixed disciplines (mostly

endurance athletes) found that HRV measures suggestive of sympathetic dominance (reduced HRV) distinguished the overtrained from their recovered counterparts and untrained controls(131). HRV has also been effectively used to guide training for long-distance running (132).

However, one study that induced a cycling performance decrement (OR), **in part by increasing resistance training volume, failed to show an impact on HRV(133)** as one would have expected (and hoped). [These same researchers had previously documented a reduced HRV in an overtrained cross-country skier(134).] On the other hand, parasympathetic activity, assessed via high frequency HRV, mirrors weight training performance after an unusually challenging training session(135). A recent study of world-class (Chinese) female wrestlers assessed HRV weekly under controlled conditions and found that nonfunctional overreaching was associated with **either** a substantial increase or decrease in rMSSD and SDNN scores, i.e., **some** substantial change in HRV in the time domain(136). **Figure 5: Three shirtless guys (with John Vasquez) who went on to be Mr. Arizona (Scott Stevenson), WFF/NABBA Mr. Universe (Mike Gustavsson) and 202 Mr. Olympia (Dave Henry), none of which has any direct relevance to HRV.**



So, it seems that the finding a generalized, one-size fits all formula for using HRV to guide resistance training (bodybuilding) autoregulation has yet to be found. In highly trained athletes, HRV values have been found to differ by sex, but not if one compares endurance vs. strength/

power athletes(137). It's been suggested that overtraining could manifest in the autonomic nervous system as vagal (parasympathetic) or sympathetic "type"(103), having disparate effects on HRV just as found in the study of female wrestlers mentioned above(136). Indeed, the hormonal responses to resistance training seem to differ in from those typically found with endurance exercise overtraining(106, 114), and may vary as a function of training volume vs. intensity(104). This is relevant especially for those of you who might include a substantial cardiovascular component (e.g., Pre-Contest) in your training load: Is the cardio, the weight training and/or some feature of one or the other that's to blame if you start to lose strength?

Generally speaking, the few studies that have assessed changes in HRV in overreached or overtrained athletes have shown mixed results(101). A (somewhat dated) meta-analysis found that a higher ratio of low/high frequency HRV power was predictive of overreaching in **short studies**, but **not longer interventions**(138). On the other hand, a more recent meta-analysis(139) found that high frequency power did not track uniformly during training that showed adaptation (improved performance), whereas rMSSD was useful in this regard [as concluded elsewhere(140, 141)]. Regardless, neither resting HRV nor vagal-related HRV indices were found to be uniformly sensitive to overreaching in this analysis(139).

The current state of the research suggests that including HRV as a tool in the toolbox of indicators of training "fatigue"(137) and that other HR related measures may prove useful down the road as research continues(139). From a practical standpoint, given the growing number of HRV devices that are available on the market, you, **the informed bodybuilding coach should know that an HRV monitor isn't a fool-proof way to prevent unwanted overreaching or overtraining**. However, HRV measures may be a useful **warning system** that you're under more (training and other) stress than you are immediately aware of (or willing to admit), and way to corroborate other indicators of recovery (such as mood, a training log, Perceived Recovery Status, sleep records, etc.). Some rules you might apply when it comes to monitoring HRV in the context of autoregulation include:

- Track your own personal HRV measurement (and don't necessarily compare this to others' values).
- Correlate, corroborate, compare and contrast your HRV with other measures of recovery, such as your PRS, sleep analysis results (which some smartwatches and even some CPAP machines can provide).
- Track HRV in the context of training performance,

training load, diet and period of the year.

- Recognize that drugs like stimulants and alcohol may impact HRV(142)

Preventing and Recovering from NonFunctional Overreaching and Overtraining


So here you are: You've actually overdone it. You've pushed too hard for too long and simply taking a few days off from the gym doesn't do the trick. You're nonfunctionally overreached (at the least) and possibly "classically" overtrained.

PREVENTING OVERTRAINING



- 1 **PAY ATTENTION TO THE SIGNS & SYMPTOMS – RESTRAIN YOURSELF, IF NEEDED!**
- 2 **LOG YOUR WEIGHTS**

- 3 **USE THE PERCEIVED RECOVERY STATUS SCALE**
- 4 **PERIODIZE & AUTO-REGULATE YOUR TRAINING**

- 5 **IF POSSIBLE, EAT MORE:**
 - CARBOHYDRATE
 - FRUITS & VEGETABLES
- 6 **IMPROVE SLEEP & CONSIDER THE SAUNA**

- 7 **MANAGE STRESS**

- 8 **FIND MORE WAYS TO ENJOY LIFE!**


enjoy every moment. ©Scott W. Stevenson

Don't beat yourself up (and more than you already have) about it, as it's quite common, especially among the elite. Perhaps 1/3 – 2/3 of lifetime athletes will experience true OT at least once, and the risk of

recurrence is even higher in those previously diagnosed(101, 143). Naturally, prevention and treatment of OT include the same (common sense) approaches one would use to maximize recovery, but it makes sense to focus first on prevention(101), an ounce of which is worth a pound of cure.

Generally, the following measures can be taken to **prevent** nonfunctional OR and, and thus OT:

- **Log your weights/training loads** in some way, so you have an objective measure of performance (improvement or decline). A simple means to do this, if not already built into your training program (e.g., as in **Fortitude Training®**), is to record performance (load/reps) for several “go to” exercises [e.g., incline barbell press, squat, (rack) deadlift, etc.] that you repeat on a regular basis.
- Pay close attention to the **signs of OR and OT noted above**. This can be done in your training log, in a simple diary fashion. Researchers have even suggested using psychometric measures such as a profile of mood state (POMS) and psychomotor speed tests to gauge the psychological impact of OR/OT (101, 144).
- More formally, you can use the **Perceived Recovery Status Scale** (see above) to track your recovery status and use this to guide yourself while autoregulating your training.
- Employ a **periodization strategy** that ensures that you re-assess your state of recovery(145) and include some form of deloading, taper, merely taking a day or two off from the gym and/or active recovery (activity other than weight training, formal cardio, etc.). This is built into John Meadows' **Mountain Dog Training** and my **Fortitude Training®**.
- Use all of the above to **auto-regulate** your training, rather than follow a strict periodization plan that does not account for individual differences in training recovery(146). One might include autoregulating various aspects of one's training load, including volume, intensity, type of set (cluster, straight), the inclusion of intensification techniques (forced reps, negatives, drop sets), *etc.*
- Eating plenty of polyphenol-rich **fruits and vegetables**

is a healthy way to improve antioxidant defenses and guard against long-term inflammation, including feeding the gut **microbiome's production** of healthy, bioactive phenolics(147). (For more on fruits and vegetables, see [Section 3.4](#). For more on polyphenols and antioxidants, see [Section 3.6](#).)

The following can be used to treat/recover from Overtraining, but some are also means of preventing OT as well:

- **Restrain yourself** from continuing to train with vigor, despite your likely desire(148) to continuously do so.
- Use time that would otherwise be used for training **doing things you enjoy** (relaxing and recreating) with friends and family
- **Manage Stress.** If you haven't been already, **incorporating stress management practices** into your life, such as **meditation**, breathing exercises and progressive relaxation has been shown to counter the symptoms of overtraining, even allowing for a greater training stimulus(149). What form of stress management you choose may vary(149), but this is both a form of prevention and treatment for OT.
- **Sleep Well.** Obviously, ensuring **sleep** is adequate (both in duration and continuity) is vital for recovery, a topic covered in the [Chapter 3 Special Section: Recovery](#).
- Additionally, the **sauna** can be a valuable recovery tool, which is also covered in a [Chapter 3 Special Section: Recovery](#) .
- **Eat enough food!** Ensuring **caloric adequacy** is vital as well, with a premium on carbohydrate(101), especially if you've been limiting carbohydrate intake. As noted below in the [Chapter 3.2 Sections on Macronutrients](#), a bedtime carbohydrate meal may help initiate sleep(150-152), and a higher carbohydrate diet can also dampen the mood disturbance that often comes along with increased training load (153). Also, a **PeriWorkout Recovery Supplement** (see [Section 3.8](#)) that includes **carbohydrate** may limit cortisol release and promote muscle gain(154, 155) and counter postexercise immunosuppression(147)

Chapter 2 SPECIAL SECTION: Bodybuilding, Hormonal Manipulation and Your Genetics

It's no secret that bodybuilders make use of performance-enhancing drugs (PEDs), in particular those that enhance muscle growth or aid in fat loss (156). Most conspicuous of these for decades have probably been anabolic androgenic steroids (AAS)(157-163). It's been estimated that the increase in AAS use over the past 20 years is on the order of 2000%(156, 164, 165). More recently, (human) growth hormone (GH) [in particular recombinant human growth hormone of the 22kDa molecular weight variety(162, 163)] has become a focus of testing for illicit PED use among athletes(166, 167).

Still, it was not **always** recognized by the scientific community(168) that AAS do indeed increase muscle mass (in and of themselves) and also enhance gains in size and strength(162, 169-171). It's been demonstrated scientifically that GH promotes lean tissue (especially connective tissue) accrual and favors fat loss **in cases of deficiency or obesity**(172, 173), and when given in high doses (5+IU/day) are given to those without hormonal deficiency(174). However, the effect of supraphysiological GH as a PED or "game-changing" bodybuilding drug has been doubted, given the scientific evidence at hand (175, 176). Of course, many of you may think differently, given personal experience or that of close friends. [It's tempting to speculate that by promoting fat loss, using large, expensive doses of GH might encourage an (otherwise body fat-phobic) bodybuilder to consume more food and be more meticulous in ensuring recovery ("get the most from his cycle"), and thus foster greater gains in muscle mass.]

So, why is it that opinions are (or have been) so variable when it comes to the effects of these PEDs?... Is this a matter of poor science, placebo effect, and/or outright lies, or are there biological differences that may account for these discrepancies. As touched upon in my book **Fortitude Training®**, **biological interindividuality** is perhaps larger than what might be commonly assumed. We are indeed "all humans," but we are all individuals, as well. [A trip to the airport in a large metropolitan area usually provides visual confirmation of the diversity in our species.] The scientific examples below illustrate how substantial these interindividual differences can be when it comes to fundamental aspects of metabolism, as well as responses and adaptations to drugs, food and exercise training:

- **Drug metabolism** can vary dramatically, including over-the-counter (OTC) drugs and other compounds

that may be labeled as supplements. For instance, the initial step in metabolizing yohimbine HCl, a ubiquitous OTC fat-burning supplement, can be very sluggish, meaning that some individuals have very poor clearance and very prolonged elevations of blood levels of the drug (177-179). I have seen this personally in the wide degree of tolerance to yohimbine HCl. (Be wary of combining it with other stimulants such as ephedrine.)

- Even the simplest of foods do not necessarily elicit **glycemic responses** you can count on when you eat them(180). One study comparing **white bread** vs. glucose found that the within-individual differences in **the glycemic index** were more than twice as great as the variability across individuals(181). In other words, the glycemic index of a given food, for a given person, even if eaten under what seems like the same circumstances, can vary greatly.
- The wide range of interindividual glycemic responses holds true when it comes to **entire meals**, as well(182). Variability is known to be a function of several things, such dietary habits, body size and composition, physical activity and gut **microbiota** (healthy bacteria in your gut), the population of which is changes if your diet does(182).
- If a meal plan and exercise strategy is meticulously created to generate a known caloric excess or deficit initially, after adhering to this same plan for several months, the **body fat** and **muscle mass** gain are highly **individualistic** (but much more similar in identical twins than unrelated individuals)(183-185).
- Not only are the post-resistance exercise increases in **myofibrillar protein synthesis** (MPS) extremely variable, the resultant gains over the course of months of training are only poorly predicted from the initial MPS responses to acute resistance exercise(186-188). [As an interesting aside, recent correlational data hint at the importance of increasing MPS and avoiding excessive muscle damage, if one wants to promote muscle growth(188).]
- The above likely contribute to many factors explaining why there is ample evidence documenting tremendous

variance in **trainability** (extent of training adaptations) among individuals, when it comes to **gaining muscle size**(31), **muscle strength**(189) and **cardiovascular capacity** as well(91). When it comes to gaining muscle mass from hitting the weights, this is likely a function of factors such as differences in the initial density of satellite cells(40) and the extent of myonuclear donation(40, 190) [satellite cells provide nuclei for growing muscle cells(191-193)], variation in the expression of myogenic genes such as the transcription factor myogenin and the growth factor MGF(39), differential microRNA expression in response to resistance exercise(194) [microRNAs are non-protein coding RNA molecules that prevent translation of messenger RNA(195)], and perhaps previously underestimated “muscle memory” due to epigenetic changes(38, 196) and satellite cell deposition(41, 42) [which occurs with anabolic androgenic steroid use(100)] that facilitates faster (re)gain of muscle mass.

Still, one mustn't forget that there are similarities among individuals, and currently, **genomic science isn't quite developed well enough** to conclusively identify the specific athletic aptitude(197), or entirely personalize one's diet approach(198), for instance, based on DNA analysis, although in time this will surely be possible. [Unfortunately, direct-to-consumer genetic testing may be fraught with error, including a 40% false-positive rate for genes that carry a higher risk of disease(199).] It seems that simply taking a detail-oriented “precise” approach based on “known” genetic factors (including family history), as well as environmental and lifestyle variables makes more sense(200). In other words, being a good bodybuilding coach means taking a holistic approach to learning the ins and outs of the “client” (you) vis-à-vis scientific insight and “good ole in the trenches trial and error.”

Luck of the Draw: Responsiveness to Anabolic Androgenic Steroids and Growth Hormone

The biggest question many bodybuilders have (or are not willing to admit the answer to) is, "Have you got what it takes, genetically speaking, to be a top level or even elite bodybuilder?..." Well, chances are, you would have probably figured this out long before reading this book, simply from your natural athleticism or how you responded when you started training with weights. It's a common

story that the world's best bodybuilders shine brighter than their peers from the get-go and/or distance themselves rapidly once they start they dig their heels into bodybuilding. Mr. Olympia Phil "The Gift" Heath's competitive record is a fine example of this. Using online search engines, I performed an informal analysis of the top 10 finishers in the 2016 Mr. Olympia: From their first competition to the year they turned earned professional status in the IFBB took <4 years on average.

However, the extent to which genetics matter is also a function of how the environment (or the various aspects of a bodybuilders lifestyle, in our case) interacts with one's genetic proclivities (201). It can be helpful to remember that one's genetics determine one's "constitutive" or baseline level of gene expression, regardless of external stimuli, as well as responses and adaptations to the environment, e.g., training, nutrition, drugs, *etc.* **Also, know that bodybuilding is not "all" genetics.** [Even a highly heritable trait like height is only about 80% dependent upon one's genes (201), which means that a fifth of the normal variation in height depends upon the environment (e.g., nutrition)(202, 203).] **What we can take from this is that, there's a good chance that patience and a lot of hard "work" in the gym and at the dinner table, i.e., consistently dotting your i's and crossing your t's as a bodybuilder, can indeed pay off over the long run .** For instance, as a personal example, I first competed at a stage weight of ~163lb in decent condition. For the next ~15 years, I gradually added stage weight (with monumental effort), and now regularly step on stage 50-60lb heavier, as a **young** "Master's" competitor, in better condition than my first show.

Still, when it comes to training adaptations, the genetic underpinnings of muscle size, strength and power is a blossoming and highly interestingly field of study, especially now that the human genome has been mapped(204). In the case of endurance exercise, calculations have been made showing that while the possibility that someone might have all of the (recently determined) genetic polymorphisms to optimize performance is very low, it is not zero (205). The same likely holds true when it comes to the most important genetic determinants that make for good potential as a bodybuilder (muscle size in particular). The genes significantly associated with a size/strength/power athlete profile can generally be categorized as those that control **muscle cell architecture, anabolic processes** (e.g., protein synthesis) and **inflammatory factors** (like cytokines) that coordinate metabolic signals between cells and tissues(206, 207). For instance, Interleukin 15 (IL-15) is a muscle-derived cytokine that coordinates body composition (the ratio of fat to

muscle) and is under the control of a very complex system of regulation(208). This is not a simple science, as the importance of genotype is further complicated by sex and race. As examples, **sex** determines the importance of the genes for Actinin 3, a sarcomeric protein, as a predictor of sprinting performance(209) and strength gain(210), and the relevance of the gene for activin receptors (myostatin receptors) when it comes to variation in strength and muscle mass(211). **Race** has been shown to differentiate how important the genes for myostatin and follistatin themselves are for **baseline** measures of strength and muscle mass(212), but their importance when it comes to **gaining** muscle is not as clear(213). **Race** is a predictor of the extent of CAG trinucleotide repetitions in the androgen receptor (AR) gene(214, 215) (lowest in Afro-Caribbeans and blacks) which is inversely correlated to AR activation by testosterone (216). Shorter CAG repeats length is associated with higher prostate cancer risk (217), and risk of depression with male hypogonadism(218), but greater effectiveness of finasteride (a 5-alpha-reductase inhibitor) in treating male pattern baldness(219) and a lesser likelihood of hypertension and adverse lipid profile when administering testosterone replacement therapy(220).

Back to the topic at hand: Responsiveness to anabolic androgenic steroids and growth hormone. What do we know of genetic factors that may determine the responsiveness to AAS and GH? As it turns out, there is information available. These sources of variability may be why scientific consensus on these topics has been unclear, as well as why your gym buddy who "eats like shit and hardly trains" seems to be "all drugs" when it comes to making gains.

- If you have the "right" gene for a particular **phosphodiesterase** (PDE7B) involved in freeing the parent/active steroid of an injectable AAS preparation from its esterified fatty acid(221, 222) (e.g., freeing testosterone from a testosterone enanthate ester), blood levels of the parent AAS that are >50% higher(223). In other words, having the right copy of this gene affords a dramatic advantage in terms of steroid bioavailability for a given dose of long-acting (esterified) injectable AAS preparations (nandrolone, boldenone, testosterone, etc.).
- As noted above, variations in the gene for the **androgen receptor (AR)** have been studied, for instance, to sleuth out the cause for racial differences prostate cancer risk(215, 217). As it turns out, the length of a particular sequence in the gene determines the strength

of the intracellular signal brought on by steroid-receptor binding(214, 216, 224). Naturally, this will impact the efficacy of different AAS for muscle building [not to mention side effects such as hypertension and hyperlipidemia(220)], depending on how tightly a drug itself and/or its metabolites bind the androgen receptor(225-228) and/or the manner in which they activate it(229). [Note here that AAS have classical receptor-mediated actions as well a non-genomic actions activity (230, 231).] In short, one's gene for the AR can impact relative effects of different AAS.

- Similarly, the activity of 5-alpha-reductase (5aR), a first line enzyme in androgen metabolism(232), varies by race and predicts prostate cancer risk(233-235). Variations in 5aR activity would impact the relative effectiveness of AAS like testosterone in comparison to nandrolone. In the case of these two drugs, the relative order of binding affinity (nandrolone > testosterone) is **reversed** after 5-alpha-reduction (226);Fragkaki, 2009 #10523;Celotti, 1992 #10525;Kicman, 2008 #10526;Shahidi, 2001 #10527}, so the activity of this enzyme would affect the balance of activity at the androgen receptor.
- Several genetically linked factors can alter the levels of serum hormone binding globulin (SHBG) (236), which according to the “free hormone hypothesis” binds androgens the blood, preventing them from acting on target tissues(237, 238). However, there are data suggesting SHBG may be a carrier protein, ushering androgens into cells via a megalin receptor, after which the androgen would exert its actions intracellularly(239-241). Thus, variations in SHBG could impact the effectiveness and side effects of different AAS preparations.

The picture that emerges when examining growth hormone's physiological profile is **no less complicated than that of AAS**. The exogenous growth hormone typically prescribed for dwarfism and used as a PED(242-244) is but one variety (with a molecular weight of 22kDa, having 191 amino acids) of “growth hormone” found in the human body(162, 163). [For those of you considering GH as an antiaging drug, take heed. The usefulness of growth hormone **replacement** – to youthful physiological levels - as an antiaging therapy is considered dubious by some, give the tradeoff between side

effects (e.g., carpal tunnel syndrome, edema and glucose intolerance) and the proposed benefits such as increased lean body mass (245, 246).]

So why might some bodybuilders rant and rave about the effectiveness of GH whereas others seem to be missing out on the magic of this injectable elixir? Well, there are several reasons for the effects of administering GH, i.e., only the 22kDa isoform, might vary by individual, not to mention the source of the GH:

- In addition to the 22kDa variety, a **sizeable proportion of the circulating GH is found in the form of shorter (20kDa) isoform**, as well as dimers and oligomers of GH molecules (twosomes, threesomes, etc. of 22kDa and 20kDa molecules bonded together in different ways) that actually may have some bioactivity (247). One can also find bioactive GH fragments, not to mention GH bound to GH Binding protein (GHBP) in the blood(248-250). Needless to say, this is a complex system with potential for variability in the physiological importance of the different GH isoforms on a person by person basis (247).
- There are variations in the structure of the GH binding proteins(250) and their affinity for GH(247).
- Approximately 50% of Europeans carry one or two alleles of the gene for the **GH receptor** that transduces a stronger signal when GH binds(251) but also confers lesser decrements in insulin sensitivity (in those with excessive GH production)(252). Still, receptor isoform variations leave a significant amount of unexplained variability of responsive to GH treatment in dwarfs, meaning there are likely many other factors at work here (253).
- Generic and counterfeit versions of pharmaceutical grade GH may vary (have a greater amount of) chemical modifications to the molecule such as oxidation and deamidation and even have greater fragmentation ("broken" GH peptides) than original "pharm grade" preparations (254). While mild oxidation may not change protein conformation (shape) *per se*(255, 256), oxidation(255) and deamidation could change how GH molecules are degraded(257) or how they aggregate(258), which could impact how/whether GH dimerizes (see above), its binding to blood born

proteins, the relative amount of free GH and even binding to its receptor(255). So, for someone using GH as a PED, the **quality of the source** is another factor that could dramatically determine effectiveness. This is something that those of you reading this who have used GH from a variety of different sources may know from personal experiences.

- It's well documented that recombinant human growth hormone (rHGH) can **illicit immunological reactions**, i.e., antibody formation (259-262). Naturally, the purpose of antibodies against growth hormone would be to immunologically tag the (xenobiotic/antigenic) protein for phagocytosis (destruction), rendering it inert and lacking in bioactivity(259, 263). (In other words, GH antibodies aren't a good sign that injected GH will bind to its receptor and exert its actions.) However, the formation of antibodies **might** not affect growth rate in children (e.g., those with dwarfism or Turner syndrome) (259, 262), at least on average in most studies, suggesting that antibody formation doesn't mean that GH is rendered inert. Still, the formation of antibodies is highly variable across studies(259) and dependent upon the brand of rHGH and method of detection(261). Still, it has been documented that very high levels of tightly binding antibodies may prevent injected GH from being bioactive (261, 264), so this is yet another source of variability in responsiveness to exogenous growth hormone.

So, consider, if you will, the synergy put in place in an individual with ideal genetics for gaining muscle mass (while staying lean) when training and eating for size, who is also a responder to the most effective bodybuilding PEDs like AAS and GH (and has access to high-quality sources of such), has a strong desire to train hard, a hardy gastrointestinal tract, a high tolerance to the rigors of Pre-Contest dieting, a low-stress job and lifestyle, and who also maintains a positive outlook on life that includes a passion for bodybuilding. With this kind of starting material, it's perhaps not at all surprising that a bodybuilder who meticulously and consistently dots all the i's and crosses all the t's (training, diet, drugs, lifestyle) over the course of a decade could produce a world-class professional physique that looks nearly most inhuman when compared to that of a peer with poor genetics for athleticism who lives a sedentary life consuming a typical Western diet.



To round out your perspective on this matter, here are two other studies demonstrating the effect of AAS on muscle growth and strength. A landmark study performed more than 20 years ago(169) demonstrated that 600mg of testosterone enanthate/week [\sim 3-6 times a replacement dose(265, 266)] roughly doubled the increase in fat-free mass and muscle size brought on by resistance training (college-aged males; 10 weeks). There were no changes in mood or anger (assessed via validated scales). (Note that this was a paltry dose compared to what is used by many AAS users (156). On the other hand, we shan't forget the power of the mind. An ingenious study performed nearly 50 years ago(267), and one of my favorite studies of all time, tested the effects of **placebo** on previously (highly) trained student athletes at the University of Massachusetts. After an 8-week most-improved lifter contest a subsample of was told they had earned the right to enter into a study on the effects of Dianabol (methandrostenolone, an oral AAS) on strength gain. (To increase their expectancy of receiving the drug, they received information and screening at the University Health Services.) During the 5 week placebo period, where subjects were told they were receiving 10mg of Dianabol/day, strength gains were **more than double** those of the previous 8-weeks. These results are even more impressive if one considers the rate of strength gain during the placebo period, which was shorter than the pre-experimental competition, was also when one might have expected gains to have slowed, not accelerated(31, 268, 269)!

Anabolic Androgenic Steroid Use and “Post-Cycle Therapy”

Naturally, **the choice is ultimately yours** to use AAS or other PEDs, which of course may be illegal depending upon where in the world you live. (My goal is not to sway you in either direction, but simply to provide a resource for coming to your own decision on this

and other matters.) A commonly asked question regarding AAS use is how to and whether one should even "cycle" these compounds, i.e., whether one should use them periodically to increase muscle and then come off them, during the course of an annual plan. This is also an individual decision. Note here that **one's (long-term) bodybuilding goals** are paramount in clarifying these kinds of issues. (By analogy, putting aesthetics aside for a moment, one would not incur an unnecessary expense by buying a 1-ton pickup truck when a much cheaper, lighter duty truck has plenty of towing and hauling capacity. Why then would you incur the potential health costs of AAS if you can reach your bodybuilding goals without them?...) Here are a few questions you might ask yourself in making the decision to use or cycle AAS. (The below questions are quite rich, so take your time in considering them.)

- What are the legal, medical and other (social, interpersonal, psychological) ramifications of AAS use, especially in your personal context (e.g., familial history of prostate cancer, psychiatric disorders, etc.)?
- Are you aware that AAS can induce **hypogonadism** (low testosterone output from the testes)(270-274) and cause **infertility**(271), not to mention increase your risk for a host of other disorders(275-280), including renal disease(281, 282), heart disease(283), heart attack(284) and stroke(285), and cardiac hypertrophy that may reverse partially(286), but not entirely(287). AAS can also be **toxic to the testes**(272, 288), and have **neurotoxic effects**(289), adversely affecting **brain structure** [e.g., reduced brain volume and cortical thickness(290), white matter abnormalities(291) and amygdala enlargement(292)]. AAS may also cause **neurodegeneration**(293) that predisposes to Alzheimer's dementia (276). These effects on the brain are likely are connected to the **cognitive deficiencies**(292) and **psychopathology**(e.g., mood disorders and muscle)(294) associated with AAS use. [It's no surprise that (male) bodybuilders may also suffer from the body dysmorphic disorder known as "bigorexia," "reverse anorexia" or, clinically, muscle dysmorphia(78, 80) that of course would predispose one to use AAS to gain muscle.] Naturally, some of the medical risks of AAS use may vanish upon cessation of use(279, 286, 287), but did you know that there is also a possibility for a

syndrome of withdrawal(274, 295) and persistent (anabolic steroid-induced) hypogonadism(271-273)?

- How will you recognize and monitor (physician, insurance, self-evaluation, etc), not to mention treat the **specific** medical dangers and side effects of AAS (and GH) use [hypertension, **hepatotoxicity**(280), hypogonadism, renal disease, brain/psychological issues, etc.(277, 281, 282, 294, 296)?
- Can you reasonably (in your own mind) justify your **bodybuilding goals** such that they outweigh and “mandate” that you take the above risks?
- Data suggest that many users of AAS users have poor body image and/or psychological disorders or issues, such as depression, dealing with divorce, poor social support(297), and may even use the drugs as a means of self-protection after being raped (298). Of course, it's no surprise that AAS use may also be associated with greater risk of (poor body image-associated) disordered eating (e.g., bulimia) (92, 299). **Is your decision to use AAS mediated by such psychological factors?**
- Have you done **everything possible in terms of diet, training, recovery and (health-promoting) OTC supplementation** to reach your goals and given those strategies a reasonable time frame to manifest? Alternatively, are you taking the " **easy way out**" by relying upon pharmaceutical assistance to do what hard work and perseverance could do?

Assuming one has decided to "take the plunge" and use AAS, several other questions arise, of course. In addition to the issue of legality, perhaps the most critical issue is where along the spectrum of use, and thus risk-taking, one's own administration of AAS might lie, i.e., how aggressive will you be and what limits will you set for yourself in this regard.

Purely for educational reasons (**certainly not meant as a recommendation or prescription**), and to help in sorting out issues related to use the hypothetical situation whereby someone had decided to use AAS, I've outlined levels of AAS use along the spectrum as I understand it to be, from Very Conservative to Heavy Use (which might be considered **abuse** by many) and created a Table to this effect (see below). There are naturally **manifold patterns of AAS use** that would and could vary over time, as bodybuilders report substantial **polypharmacy**(300), and some users might not fit in any of these

admittedly somewhat arbitrary categories and/or move change categories over the years (in both directions). Thus, this Table generically represents approaches taken by bodybuilders (and strength athletes) and may help clarify risks and rewards for some of you reading this. Above all, I hope that you view the full scope of your personal decisions around AAS relative to the **legal and health ramifications** noted above.

- **Very Conservative Use:** For those who want to focus on maintaining fertility and not risk future reliance on testosterone replacement therapy (TRT), this might entail very light, short cycles and a planned, prolonged "post cycle therapy" (PCT) period lasting at least as long as the AAS cycle itself, whereby there is physician-guided, documented fertility and self-sustained eugonadism (normal testosterone output without the use of drugs such as human chorionic gonadotrophin or anti-estrogen compounds). This user would typically avoid oral AAS, and total weekly dosage would be <5-800mg AAS/week.
- **Middle of the Road with Health in Mind:** A health-concerned bodybuilder might focus on minimizing overt health risks from heavy cycling by interspersing TRT during "off" periods (a form of "bridging"), with physician-assisted health monitoring. This individual would realize that this path may end up meaning life-long TRT to prevent hypogonadism. This user may use oral AAS, and total weekly dosage (several AAS) may range from ~800-1200mg AAS/week during a cycle.
- **(Aggressive) Middle of the Road (likely Self Monitored):** This bodybuilder might essentially do the same as in the above scenario, but "bridge" cycles with doses above clinical TRT levels, ostensibly to prevent loss of gains, but also restore sensitivity before beginning a new cycle. **Self-monitoring** of blood work might occur here, in part because many physicians are wary of legal entanglement that may come with patients self-administering AAS. This user would typically use oral AAS, and total weekly dosage may climb to ~2000mg/week "on cycle" (various AAS plus insulin and growth hormone) and drop to ~2-500mg/week when "bridging."
- **Heavy User (often without Self or Physician**

Monitoring): These individuals have decided to cycle heavily, with varying degrees of concern for their health. Typically, they will simply rotate drugs in the hope of renewing gains. Some may or may not come off, and the extent of side effects varies, depending on individual tolerance. Typical goals might be to earn a Pro card as a bodybuilder or maintain an impressive physique as an athlete representative for supplement and apparel companies, *etc.* These individuals will likely require lifetime TRT and are perhaps most likely to suffer infertility. (Infertility is not a certainty, as empirically this side effect seems highly variable, given the multitude of personal accounts of men fathering children after years of continuous AAS use.) This user would typically use oral AAS, and total weekly dosage may be **well over 2000mg/week** “on cycle,” making use of a variety of AAS, as well as insulin, growth hormone and other bodybuilding drugs, and rarely go below 1000mg/week at any time.

Below is a Table outlining the above spectrum of use typical of 1st hand reports from “the trenches.” Again, the categories of AAS users are meant to provide context and perspective when **making up your own mind on matters of AAS use.**

Table 6: Typical (Anecdotal) Levels of Use of Anabolic Androgenic Steroids Among Bodybuilders Who Use Them.

Relative Levels of Use of AAS				On Cycle		"Off" Cycle		
Level of Use	Risk	Monitor?	Oral AAS? (Dose)	Dose	Dur.	PCT	Dose	Dur.
Very Conservative	Low	MD	None	Low	Short	Yes	None	=On Time
Middle of the Road	Mod.	MD/Self	Yes (Low, Infreq.)	Mod.	Long	No	TRT	≤On Time
Aggressive Middle Road	High	MD/Self	Yes (Hi, Freq.)	High	Longer	No	> TRT	Variable
Heavy Use ("Abuse?")	V. High	Self/None	Yes (V. Hi & Freq.)	V. High	Cont.	No	Δ Drugs	N/A

Abbreviations: TRT = Testosterone Replacement Therapy; PCT = Post Cycle Therapy to restore endogenous test.
MD = Physician Monitored; Dur. = Duration; Mod. = Moderate; V. = Very; Infreq. = Infrequent; Cont. = Continuous.

In the context of balancing risk and reward along the above spectrum of users, it makes sense to try to “get the most from the least” i.e., one’s use of AAS would be as meager and safe as possible to reach one’s goals. Questions to this effect would be:

■ What are the “safest” cycles and how do you know

that?

- How do you plan to cycle on and off steroids?
- Will you attempt to restore endogenous testosterone production before starting another cycle?
- If you have plans to father children, will you monitor fertility and use this as a criterion for starting/stopping cycles?
- Are you prepared for the loss and gain of muscle tissue that can come with steroid cycling and how will you attempt to maintain muscle mass?
- Will you go "cold turkey" or use some form of "post cycle therapy" (see below) to restore endogenous testosterone production (and fertility) or maintain eugonadism artificially with some form of testosterone replacement therapy (but perhaps create a greater risk of losing fertility)?

"Post-Cycle Therapy:" Restoring Endogenous Testosterone after Use of AAS

Anabolic Steroid Induced Hypogonadism (ASIH) is well documented(270, 271, 273, 274). In other words, there is a substantial risk after using AAS (specifically referring to males here), that one's hypothalamic pituitary testicular axis (HPTA) might not recover after using AAS. (The HPTA refers to the hormones that coordinate testicular testosterone production via brain structures known as the hypothalamus and pituitary gland). There are dozens of websites (some selling pharmaceuticals) that put forth a confusing, inconsistent set of strategies to treat ASIH(see below)(270).

The nature of the HPTA is that hormonal feedback inhibition, i.e., testosterone and its aromatized counterpart, estradiol (an estrogen), "feedback" information to the brain structures that control the release the gonadotrophic hormones that stimulate testosterone release(85). You can think of this like the thermostatic system that cools (and/or heats) your home. When the temperature rises above the setting ("set point") on your thermostat, your system turns on the air conditioner to cool the room back down. Similarly, when estrogen levels rise (because of rising testosterone levels converting to estrogen), this inhibits the brain's gonadotrophin release and thus the stimulus to produce testosterone in the testes.

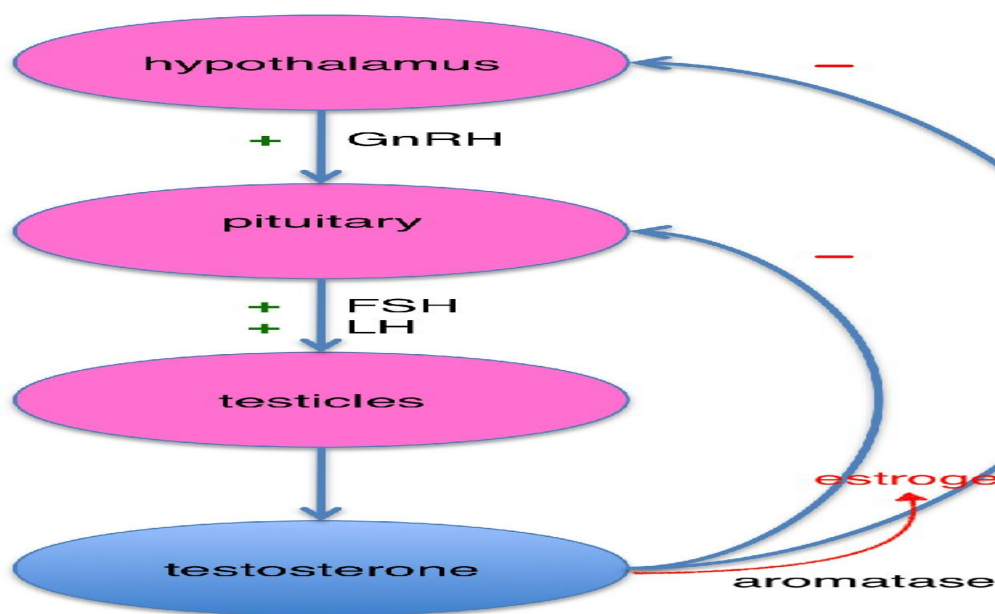


Figure 6: Hypothalamic Pituitary Testicular Axis (HPTA). (Open Source Image.)

For the above reason, selective estrogen receptor modulators (SERMs) that block estrogens actions can be used to stimulate testosterone release. Additionally, aromatase inhibitors (AI) that lower estrogen levels in the blood, also reduce this feedback inhibition and thus promote gonadotrophin release(271, 301, 302). Additionally, treatment with human chorionic gonadotrophin [HCG; structurally similar to luteinizing hormone (LH)(303, 304)], follicle stimulating hormone (FSH) to ensure normal sperm production(305) or a combination of gonadotrophins(306) can be used to replace the deficient gonadotrophins and restore function of atrophic, hypo-responsive testes(307). It seems that smaller more frequent doses of HCG (e.g., ~300IU every other day) can be used to maintain intratesticular testosterone levels(308, 309) [for supporting spermatogenesis and fertility(305, 310)], and, of course, maintain blood testosterone levels and prevent the Leydig cell desensitization that can occur with larger HCG doses (e.g., 1500IU)(311).

Naturally, HPTA restoration or “**post-cycle therapy**” (PCT) is ideally directed by a physician who specializes in this area, not only for legal reasons, but also due to the complexity of endocrine restoration in the context of biological differences. In their Program for Wellness Restoration (PoWeR) guidelines(312), Scally, Mooney and Vergel (et al.) outline a coordinated plan of HCG, SERM and AI use and timeline to check and sure that HPTA restoration has occurred, based on clinical evidence they have presented(313). [Bill

Llewellyn covers the details of this PCT approach in his book “Anabolics” as well(314).] Be wary (as your physician should be aware), SERMs and gonadotrophins can have psychological side effects such as irritability and anxiety, and even psychosis and suicidal ideation(315-319). Gonadotrophins (such as HCG) also increase aromatase activity(320-324), which can lead to an elevation of estrogen. On the other hand, aromatase inhibitors carry side effects as well, such as joint pain and unwanted changes in blood lipid profile(325-329).

Other aspects such as the half-lives of the AAS used (which dictate the extent of suppression of the HPTA) and thus the planning of AAS cycle itself come into consideration when it comes to PCT, not to mention the necessity for medical monitoring. This is an area of medicine where deference to licensed medical professionals is most certainly warranted. It's far beyond the scope of this book to recommend a standardized/generic PCT protocol, but a recent publication (272) outlines physician strategies for addressing some major medical side effects of AAS (gynecomastia, testicular atrophy, hepatic and dysfunction and hair loss). **This publication(272) also presents a generic algorithm for using a SERM to restore endogenous testosterone production from the starting point of testosterone replacement therapy (after a previous diagnosis of ASIH).**

2.3 Post-Contest Supplementation

Each of you will have a different Pre-Contest supplement regimen, and thus a different starting point as you transition into your post-contest period. There are several objectives to keep in mind at this point, which I'll delve into below, but essentially the goal here is to transition slowly away from a fat loss and into a muscle gaining strategy. Supplements would mirror one's dietary strategy here, with the caveat that **the addition of calories to the diet affords the possibility to increase the variety of whole food** (rather than supplements), which should generally take precedence. (Supplements are *de facto*, just that – supplemental!)

Post-Contest Supplementation Objectives

- **Restore health** by (gradually – see below) **removing** stressful and/or **toxic** supplements or drugs. This would include the use of “fat-burning” stimulants (such as yohimbine, ephedrine, caffeine or other related compounds, including any stimulants) and hepatotoxic compounds like oral AAS and other compounds that might have known hepatotoxicity (such as green tea extract, usnic acid, kava, or any of those in [Section 3.6](#) in the subsection on [liver health](#))(330-333).
- **Restore health by adding in/continuing** the use of supplements to **maintain and restore health**. This could include those with **cardiovascular** benefit and liver health (see [Section 3.6](#) below). Now that caloric and food intake can be a bit "looser" (as fat loss is not an objective) pre-and probiotic foods can be included (in more significant amounts), and spices that improve cellular antioxidant capacity (334-337) and digestive health (again see [Section 3.6](#) below).
- **After tapering off fat-loss supplements**, as the post-contest period progresses, you would of course **maintain and perhaps add to mass gaining supplementation strategies** that you removed Pre-Contest (specifically that are not overly stressful or toxic). Strive to **get the most from the least** and make these changes in pace with your increase in muscle mass and body weight and is in concert with the rest of

your training and diet. For instance, when reintroducing more copious amounts of peri-workout or non-training day carbohydrate, you might start using glucose disposal agents [such as alpha-lipoic acid (338, 339)] that you'd previously removed (and find helpful in the Off-Season).

- Your hunger will probably make **using “real” food** the most desirable way to increase caloric intake, **at least initially**. This is an excellent time to start adding in fruits (and higher caloric density vegetables) that you might have eschewed Pre-Contest when cutting calories (340). [They may very well taste better during this time, an advantage for those who seek to make it a habit of eating more fruits and veggies (341).]
- **Only deeper into the Off-Season**, if/when your appetite is waning, would I suggest adding in using protein powders, carbohydrate powders, meal replacement powders, greens formulas and other **nutrient-dense supplements**. Save these as a way to truly supplement an already nutritionally complete diet that mainly is lacking in enough caloric content to foster gains in muscle mass.

Chapter 3 – Off-Season (6-8 months)

“Through repeated efforts that threaten destruction, one forges the indestructible.” –Scott Stevenson

Ok, now it's go-time! You've either been training during the post-contest period and perhaps taken a break, or had a prolonged post-contest recovery period. Ideally, you're in a good place as far as your Perceived Recovery Status, body composition, mood, and general health parameters. It's time to dig in, and make improvements!

If you've taken some time away from training, it won't take much to get you sore and to create the stimulus you need to grow (don't overdo it – see below), and within a few workouts, you'll be back in the swing of things: The soreness of novel, unaccustomed exercise will quickly fade, however, a phenomenon known as the repeated bout effect (342-344). Also, if you have perhaps even detrained (lost muscle mass), you'll have muscle memory on your side, too, in the form of satellite cells waiting to orchestrate muscle hypertrophy and epigenetic alterations favoring gene activation(38, 41, 42), not to mention neurological adaptations that will make it easier to get into the swing of things in the gym(345).

Ramping up your training as you start the Off-Season should be done intelligently and methodically, however, and will vary depending on your personal recovery level and training style. Again, get the most from the least here, i.e., as you are essentially "retraining" such that initially, you don't need (nor can you adequately recover from) the top-end training volume and intensity you might have once used. As a simple example, my training system, **Fortitude Training®**, has three Volume Tiers built into the program, to allow you to vary training volume based on your individual recovery abilities (both in general and relative to your life's stresses at given time). Even if you'd previously use FT Volume Tier III, you might start with Tier I initially and build up over the first 3-5 weeks of your first Off-Season Blast. John Meadows' programs typically build over the course of the first month of training, as John recognizes **the utility in building greater training stress in tandem with training adaptation (and thus recovery abilities)**.

The Off-Season is also when you should also begin to monitor your nutrition more closely (if you haven't been already), as a primary strategy is creating a caloric surplus that pushes you **beyond previous levels of muscle mass**. As noted in Chapter 2, the reality of the

situation is that you will eventually add body fat back, as extremely low body fat levels are not healthy or good for your mood(7). [Anecdotally, joint pain is especially worsened by staying very, very lean for prolonged periods of time, as well. I've personally spent prolonged competitive seasons within a few pounds of contest shape and suffered the arthralgic effects of staying in the "Danger Zone" for so long.] Of course, adding body fat will also mean adding fat-free (muscle) mass, as well(185, 346-348), but the goal will be to optimize the composition of this body weight gain. (For more on the particulars of this approach, see [Section 1.3 Goal #1](#).) Over the course of the Off-Season, you will want to titrate (increase or decrease) calories and or specific nutrients, based on what you are seeing in terms of the weekly progress markers ([Section 1.2](#)), especially:

- The mirror – your overall appearance.
- Scale weight.
- Body fat: Overall body fatness or estimated % body fat and skin Caliper reading. (See [Section 1.3 Goal #1](#) and [Section 3.2](#) below for more on skinfold calipers and body fat.)
- Strength gains.
- Perceived Recovery (Energy Level).

As a rule of thumb, it's not ideal for men to get over 10-15% *and women to exceed* 20-25% body fat in the Off-Season. This is for reasons, among others, of body image and adverse health effects of high body fat such as high blood pressure, dyslipidemia, *etc.* (See [Section 1.3 Goal #1](#) for more on determining how much body fat is too much. Obviously, the leaner you can be the less body fat you will have to lose Pre-Contest, which should foster tighter skin and, ideally, less chance for muscle loss Pre-Contest. Adding body fat needlessly can indeed hamper your gains at some point due to loss of insulin sensitivity (see [Section 3.7](#).) So, fight the urge if you have one to throw caution and common sense into the wind and mindlessly "bulk" and "power-shove" food during the Off-Season.

3.1 Off-Season Monitoring: Guideposts for Gains and Goals

As detailed in Section 1.2, weekly progress markers are intimately connected to progressing toward your goals for the year, so they are worth addressing again here, at least conceptually:

- **Body Fat Estimates (and the Mirror)** Are you staying under your own body fat percentage limits? (Again, see [Section 1.3 Goal #1](#) for more on this topic.) You may set a visual limit on body fatness, based on your comfort level with how you look or feel, and/or use body fat percentage estimates to set your upper boundary here. I've found that if you get "too fat," and simply dislike how you look, this may consciously or unconsciously sabotage your efforts to make further gains in muscle mass. The bottom line here is that we love bodybuilding because of how it changes our physiques, and everyone differs in what is an acceptable and practical upper limit of Off-Season body fatness.
- **Muscle Size (and the Mirror)** Naturally, visual inspection of your muscle growth makes sense, as this is how the judges evaluate your physique. Additionally, simple measuring tape measurements can be useful. As cliché as it may seem, I've found that making arm or thigh circumference (girth) measurements can be useful as an indirect measure of muscle mass, as these areas (with the exception of women when it comes to the thighs) tend to gain less fat during the Off-Season. Paying close attention to how your clothes fit can also be helpful. (Are the shirts and pants getting tighter in the sleeves and legs, or around the waist?)
- **Strength** Are you getting stronger? More muscle generally means greater strength([349](#)), the basis of the principle of progressive overload([350-352](#)) when applied to bodybuilding. More simply, you should be getting stronger as you gain weight, but not at the expense of properly activating the target muscle(s) you are training.
Both my (www.fortitudetraining.net) and John Meadows' (www.mountaindogtraining.com) training systems, and especially Dante Trudel's DC Training (see www.intensemuscle.com) employ progressive overload

to drive muscle growth.

- **Energy Level (Perceived Recovery) and Performance**
Are you attacking your workouts with focus and intensity and feeling recovered after your training sessions? I address how you can ensure that you're recovered properly (or at least avoiding overtraining if you intend to create a functional overreaching rebound effect) using the Perceived Recovery Scale in the [Chapter 2 Special Section](#) on this topic.)

These guideposts are revisited in a bit more detail in the subsection on [Off-Season Dietary Adjustments](#) below.

Off-Season Growing: Adjusting Your Diet

While using your chosen selections from the above "toolbox" of weekly progress markers, there are (at least) three important "rules" to abide by when adjusting diet during the Off-Season:

Off-Season Dietary Rule #1 – Generally Make Just One Change at a Time

There is often no need to change multiple factors (i.e., food choices/ amounts on both Training and Non-Training Days) at once, and it will likely cause confusion when you try to pinpoint exactly what is working and not working. Keep it simple.

Off-Season Dietary Rule #2 – Small Moves: Get the Most Out of the Least

Patience is a virtue that very often pays off in the end. As I have mentioned before, don't make overly large, drastic changes in your diet if at all possible. Why add 1,000 calories a day when 500kcal will get you growing *muscle mass* just as well (with less fat gain)? Making smaller moves in this way, as often as is needed to ensure progress, **optimizes the ratio of muscle/fat gained**, gives you room to add calories as needed down the line without “playing all your dietary cards” at once. When trying to push the limits of muscle mass, most everyone will eventually reach his/her own personal ceiling in terms of caloric intake. In other words, making small moves will give you more opportunity for sustained progress. This is one of the hardest things coaches to do (and for you to do as your own coach): We want tomorrow's results "yesterday," and this creates the urge to cram decades of results into a year's time. Social media (Facebook, Instagram, etc.) often bombard us with transformation pics


the depict dramatic physique changes without conveying a realistic sense of all that went into it (including genetic proclivity – as rarely are the less impressive transformations put forth by coaches – and perhaps even radical pharmaceutical use). Consistency and patience, along with a determined attitude and reasonable course of action, all but ensure progress, not to mention longevity. (If you are like me, you want to enjoy bodybuilding for as many years as possible.)

Off-Season Dietary Rule #3 – Do your Best to ensure a Nutritionally Complete Diet at All times.

OFF-SEASON DIETARY RULES



Important “rules” to abide by when adjusting diet during the Off-Season.



RULE #1 - ONE CHANGE

One Change at at Time. Get the Most from the Least!



RULE #2 - SMALL MOVES

Smaller (**but productive**) changes optimizing muscle vs. fat gain.



RULE #3 - SOUND DIET

Off-Season is your best Period to Ensure a nutritionally **complete** diet.

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This rule should be quite easy to stick to during the Off-Season: The sheer amount of food (and caloric intake) should permit some leeway of including a variety of (whole) foods. (Pre-Contest, a lower caloric intake may not permit as much of a margin for error, and this is where supplements can come in handy.)

3.2 Your Off-Season Nutritional Starting Point

Don't make the "mistake" of thinking there's a particular (magical, special), gains-ensuring macronutrient intake starting point you should adopt at the start of your Off-Season. In keeping with the "get the most out of the least" principle, Off-Season diet should be **based on your current diet**. Ideally, you're proceeding from a post-contest period where you monitored or at least made careful notes about your **dietary intake when you finished the Post-Contest period**, and this provides the best Off-Season starting place. If for example, your caloric intake was 2,900kcal before your break and your weight gain was relatively stable, then we can pick off from there and begin this phase, sticking with the same meal structure and frequency ([see below](#)).

Otherwise, you can easily determine your current intake by performing a representative **dietary recall** and using at least one of many nutritional calculation software packages (online or installed on your computer) to determine a **baseline**. For some, a representative intake may only require you to distinguish between training and non-training days. For others, diet may vary on weekdays vs. weekends or across different training days.

Principles of your Off-Season Dietary Plan

The figure below represents a **Nutritional Hierarchy of Importance (NHI)**: A guide for prioritizing and changing various aspects of your bodybuilding diet during the Off-Season, as well as Pre-and Post-contest Period.

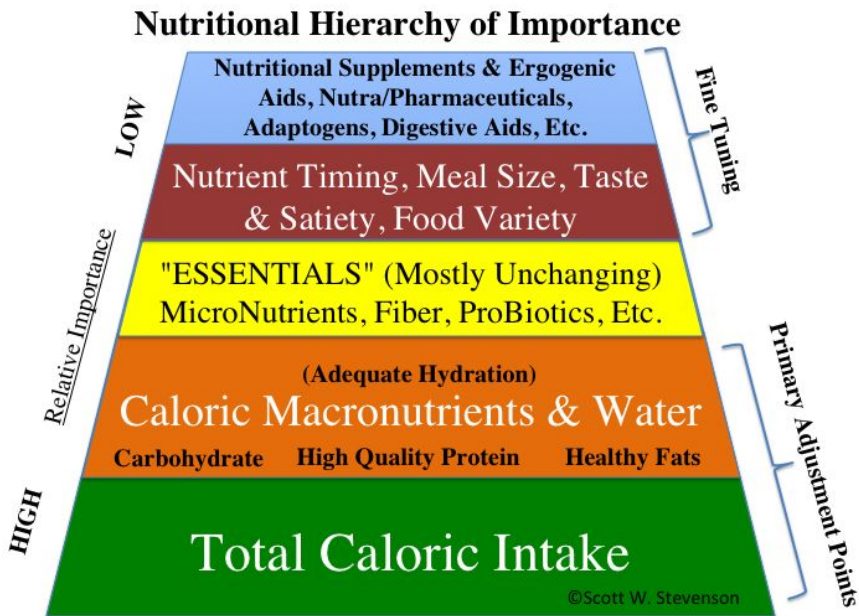


Figure 7: Nutritional Hierarchy of Importance (NHI), a guide for prioritizing nutritional adjustments (year round) in the context of bodybuilding.

As you can see, **total caloric intake** and the main three **macronutrients**, carbohydrate, high-quality protein and healthy fats (plus water as an essential component of life) form the basis of the NHI, in my opinion. **In the middle** are **dietary essentials** that will likely **vary little** regardless of what Period of the year you are in (e.g., adequate fiber is a good idea year-round). At the top of the pyramid are aspects of intake (timing, taste, meal size, etc.) and the "icing" which includes various over the counter products that have functions that interact with food. (Examples here might be digestive aids, glucose disposal agents, food-derived nutraceuticals such as curcumin preparations, etc.).

It's worth noting here that **a large amount of the products, dietary strategies, news and marketing ploys you are likely exposed to come from the top of the NHI**. Items from these categories represent the "**magic bullets**" and special dietary twists and manipulations used to create hope (and the associated product sales). For example, they proffer the notion that there is an easy (or at least much easier) way to get lean or add muscle mass, that you can violate the law of thermodynamics (as in "eat as much as you like and still lower weight"), or that it's unnecessary or there is plenty of room to slack on a what's portrayed to be a monotonous, boring regimen of regular, healthful eating.

The NHI therefore is both a way to guide your diet as well as a

reminder stay focused on the basics, using the bases of the hierarchy to steer your bodybuilding-focused nutritional approach throughout the year.

Foundational Requirements for Gaining Muscle Mass: Making Caloric Adjustments

Total Caloric Intake

As I mentioned above, it's common (and logical) to seek out a mathematical formula to determine the optimum nutrient (caloric) excess to ensure muscle gains. However, while several energy expenditure estimation equations do indeed exist (e.g., the Harris-Benedict (353) among others(354)], as well as activity monitors that produce various estimates of caloric expenditure(355, 356), the extent of weight gain upon introducing a caloric excess varies dramatically, in particular as a function of one's genetic proclivities(183, 185, 347).

Thus, your starting caloric intake will simply **proceed from where you left off in the previous training period** (or be based on your current diet and how this is changing weight and body composition). Estimation equations are just that – estimations – and cannot be more specific to your situation than what your actual current diet it.

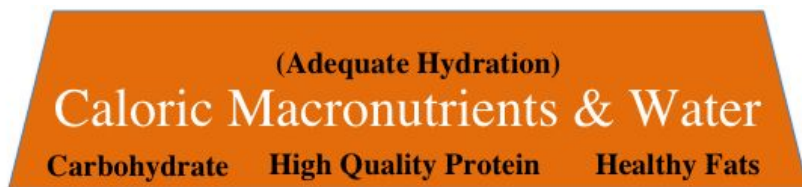
Indeed, how one goes about making caloric adjustments also plays a role. If you can't shake loose the adage that "a calorie is a calorie (357)," consider what you might expect if someone were to consume an extra 1000 kcal/day from protein, spread throughout the day, compared 1000 calories of bacon grease consumed entirely at 3 AM. (This extreme example illustrates how both timing and macronutrient composition can make a difference in body composition. Obviously, the differences will be more subtle with more sane diets, but I hope you get the picture.) The figure below is an overview of an idealized Off-Season accumulation of muscle and fat (with muscle growth exceeded body fat deposition), the main Guideposts for assessing progress (which would be part of your weekly checkins), and Basic Strategies you could employ to reach pre-determined goals.



Figure 8: Off-Season Progress Illustration, Guide Posts and Goal-Directed Strategies

Keep this figure in mind and feel free to reference it when taking in the material below covering how to steer your diet towards (Off-Season) goals.

Foundational Dietary Requirements – Caloric Macronutrients (Protein, Fat & Carbohydrate)



"Macronutrients," abbreviated as "macros," is simply a term that refers to those nutrient types needed in large quantities, for bulk energy (fats and carbohydrate) and giving the body structure (protein) among other things. You might call these three **the dieter's trinity**, as they are the main adjustment points in your diet.

Each of these macronutrients has a specific caloric value, of course. Proteins and carbohydrates are worth 4 calories per gram energetically (**when oxidized in the human body**), whereas fats are worth ~9 calories per gram(358). A "calorie" is simply a unit of measurement for the amount of energy contained within a nutrient. At its simplest, a "diet" is simply a budget for the energy that you provide your body through nutrition. (Water and fiber can be considered macronutrients as well(359). While water has no caloric value, fiber may be converted via colonic bacteria to short-chain fatty acids that enter the bloodstream and are oxidized (360).]

Protein: When and What?

“High protein” diets generally improve body

composition(361), and protein provides both the building material for muscle (with our focus being on contractile material) and the stimulus for driving the protein anabolic process. In recent years, it's been demonstrated that there is a plateau in the **postexercise anabolic** (muscle or myofibrillar protein synthetic) response after consuming somewhere between a ~20g(362, 363) and ~40g **dose of a high quality (e.g., whey or beef) protein(364-366)**. [Some studies comparing soy vs. whey protein suggest that soy may not be an optimal choice(367) for turning on myofibrillar protein synthesis(368, 369) and muscle growth(370, 371), although soy improve antioxidant status unlike whey(372).] Myofibrillar protein synthesis is largely regulated by leucine and essential amino acid content [driving protein synthesis(373)] as well as insulin release(374), which is especially important in attenuating muscle protein breakdown(375-377).

The **overarching picture** borne out in the scientific literature to favor **consistently elevating blood amino acids** (both essential and non-essential) and providing a **nutrient energy source** (to drive MPS) (which bodybuilders have known and done for years during the Off-Season). On the one hand, the protein synthetic response to an elevated blood amino acid levels **slows** after about 90min and remains refractory (the muscle is "full" and can't maintain elevated levels of protein synthesis) even if blood amino acids still remain elevated(378). This effect is not remedied by taking in smaller, more frequent protein (EAA) feedings(379).

However, the "**muscle full**" effect [kind of "proteinstat" homeostatic mechanism(380)] may be overcome with feeding leucine or **carbohydrate** (which may restore energy status(381, 382)). On the other hand, while using EAAs or a leucine-enriched protein source, a **very small dose** (6.25g) may transiently spike protein synthesis, the effect **does not persist(383)**, perhaps because non-essential amino acids become limiting. Additionally, if **only** a relatively small amount of protein (18g) is consumed post-workout, myofibrillar protein synthesis may be **improved** by slowing the rate of entry to the amino acids by coingesting a fat (energy) source [e.g., by eating whole eggs versus egg whites only(384)]. Additionally, adding casein (a "slow protein"), rather than BCAA s and glutamine, to a large whey protein postexercise supplement enhances muscle growth (385).

It's also important to note that even 24hr after a resistance training bout, skeletal muscle retains the postexercise increase in sensitivity to the anabolic effects of amino acids(386). Of course, then, it also makes sense to provide a decent dose (~40g or more for a larger bodybuilder) of protein to foster protein synthesis and **recovery overnight** after a late day workout when sleeping(387) to take advantage of this effect. Importantly, doing so does not attenuate

the resistance exercise-induced increase in sensitivity to protein the next morning(388). The bottom line here, if we want to optimize the muscle building process Off-Season, is to **regularly consume high quality, leucine-rich, complete protein sources (not just EAAs by themselves)**, for at least a 24hr after a workout, including carbohydrate as well during at least part of this period. In other words, "feed the machine" is a round-the-clock job involving high quality protein and the calories needed to sustain the muscle growth process.

Taking advantage of this prolonged capacity for increases muscle protein synthesis bears out what bodybuilders have found effective for years(389). Recent recommendations specify spreading out (smaller) amounts of high quality complete protein (e.g., 0.25g/kg or 25g for a 220lb bodybuilder) frequently (about every 2hr)(390, 391). In support of this, a recent large-scale systematic review of nearly 2000 studies found that consuming protein supplements **between** meals (as opposed to consuming extra protein with meals) results in greater gains in lean mass(392) at the **slight cost** of greater gains in body fat. However, note here that **how one distributes protein during the day may not matter with lower protein intake(393)**, i.e., **getting adequate protein intake in a given day, first and foremost, should be one's primary concern(394-396)**. Importantly, the logical extension of this protein pacing strategy(397) to consume (slow releasing, such a casein) protein before bed to enhance recovery and maintain a positive protein balance 'round the clock(398-400) actually translates into greater gains in fat-free mass(401, 402).

As you may know, the typical American(403), like many bodybuilders eats far more than 20-40g of protein in many meals. Are we as bodybuilders wasting this protein somehow?... As it turns out there is an incrementally greater increase **whole body** anabolic effect (the balance of synthesis/disappearance of amino acids and breakdown) **up to at least 70g of protein/meal**, which is likely due to effects of insulin and deposition of protein in non-skeletal muscle tissues, as well(404-406), but the specifics of protein metabolism are not entirely clear here(404). I'll cover daily total protein intake more below.

How Much Protein per Day?

Meta-analyses suggest that supplementation with protein – **adding about ~50g/day(395)] or enough to reach a daily intake of about 1.7-2.0g/kg(396)** – improves the rate of muscle (or fat-free mass) gain. This falls right in line with long-standing (407) and more recent(408) recommendations and longitudinal research(409). [It's

important to note that protein needs may be even higher when calories are restricted(410), e.g., Pre-Contest(390, 411, 412). See [Section 4.1 on Pre-Contest Dieting Rules of Thumb](#) for more on Pre-Contest protein intake.] For a 100kg (220lb) bodybuilder, this equates to approximately 200g of protein per day. [If you were following along with the math, consuming .025g/kg (25g) every two hours over a 16 hour day would also result in a 200g daily intake. Eating about 40g of protein in each of five daily meals would also do the trick.]

Although older (unreplicated) data exist suggesting that even higher protein doses may be advantageous for muscle growth(413, 414), more recent research found that ~3.3-4.4g/kg/day (340-440g in a 220lb bodybuilder) neither improved muscle mass accrual, nor caused significant body fat gain or adverse health consequences over the course of 6 months(98, 415, 416). [These studies further substantiate the **lack of scientific evidence that a high protein diet is harmful to those with healthy kidneys**(390, 417, 418).] This level of protein intake(419), or simply postexercise protein supplementation [30g(420)] may even result in fat loss despite increased caloric intake. [This makes sense, given the **thermogenic effects of protein** are far greater (~25-30%) compared to carbohydrate (6-8%) and fat (2-3%)(357, 421).] A recent large cohort study (130,00 participants averaging slightly more protein intake than the US population) found no association between protein intake and death from all-causes and cardiovascular disease in individuals (like most of you reading this, I presume) who were not heavy drinkers, smokers, physically inactive or obese/overweight(422). In fact, “high” protein intake (180 vs. 90g/day) during resistance training may not only favor greater muscle mass, but also improve lipid profile and insulin sensitivity(423). On the other hand, it’s been hypothesized that extremely excessive protein intake, by impairing the vital role of protein breakdown in skeletal muscle remodeling (424), could paradoxically limit muscle hypertrophy(425). So, beware the “more is better” attitude when it comes to protein consumption, as difficult as that may be!



Thus, protein intake approximating 2g/kg/day or, rounding up slightly, ~1g/lb/day is a good starting point for ensuring that protein intake is adequate, assuming one is eating high quality, EAA-rich protein sources such as those from animals (meat, milk). For the older lifter, it's possible(426), too, but not absolutely the case(427), that aging could increase protein needs (via “anabolic resistance” such that the postexercise protein synthetic effect of amino acids is reduced) (428). Interestingly, this apparent adverse effect of aging seems to be simply a matter of inactivity(429), as just two weeks of inactivity can elicit this deficit(430), whereas only a single exercise bout remedies it(431). In other words, the relatively active older lifter may not have much to worry about as far as anabolic resistance *per se*.

It's worth noting (e.g., for vegans or those with food sensitivities) that alternative, non-animal based protein supplements are possibilities. For instance, pea protein concentrate is a highly digestible(432), high branched chain amino acid-containing(433) protein source, but also may contain antinutritional factors, depending on processing(434, 435), which could lower protein quality(432, 436, 437). However, a recent study found that supplementing with isolates of pea and whey protein both promoted greater gains in muscle size than a placebo, with no differences between the two protein sources(433).]

An infrequently recognized issue is that a high-level competitive bodybuilder, who carries a larger

PROTEIN BASICS

What, When, How Much?

20-50+g/meal

~1g/lb/day: Protein
Spacing throughout
the day every 2-3 hr.

High Quality

Leucine / EAA
Rich (Typically
Animal Sources)

Peri-Workout!

Include a Whole Protein
Source in a Peri-/Intra-
workout Recovery
Supplement

Carbs, Too!

If your diet allows,
include carbs to
foster anabolism.

Before Bed!

Use a slow acting
protein a/o combine
with fats in you meal
before sleeping.

Pre-Contest

Relative Protein Intake is
perhaps even MORE
important when dieting
for fat loss!

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percentage of body mass **as muscle mass**, might require a proportionately higher relative protein dose (e.g., 250g vs. 200g/day for a 100kg competitor). Thus, as **an example**, a reasonable daily protein meal pattern might break down such:

- **6 (six) meals composed of 40-50g protein.** Use high quality proteins, focusing on **leucine-and essential amino acid-rich**(438) animal-based proteins[e.g., from meats and dairy(371, 439) as tolerated], but don't intentionally avoid plant-based protein sources, which can offer other health benefits(440).
- On training days, one of these “meals” could be found in a **peri-/intra-workout recovery supplement**, and another would be one's **post-workout meal**.

- **Consume carbohydrate with protein** to enhance insulin release and potentially augment (whole body) protein balance(154, 405, 441, 442)
- Consume a protein containing meal **before bed**, preferably containing a slow absorbing protein like **casein**(399-401).
- (As noted above: If anything, relative protein intake would increase Pre-Contest when dieting which can help both with body fat loss(390) and muscle retention(412).)

Is Fat Good for Me?

High Carb, Low Fat... High Fat, Low Carb?... Perhaps a mixed, balanced macronutrient approach... What works best for gaining muscle mass (while minimizing fat gain) is a complex question and likely **one you may need to determine to some degree on your own via trial and error**. Note that with one's protein intake relatively set in place, there will be a **reciprocal relationship** between fat and carbohydrate intake at any caloric intake: The more fat you eat, the less carbohydrate and vice versa.

Dietary fats can be generally categorized by the extent of “saturation” (extent of hydrogen bound along the fatty acid carbon chain) into the three categories below:

- **Saturated** (meat and dairy sources, but also coconut oil).
- **Monounsaturated** fats(oils such as olive, macadamia nut and vegetable oils).
- **Polyunsaturated** fats (flaxseed, walnuts, canola and soybean oil for **alpha-linolenic** acid; marine animals like salmon, mackerel and krill, as well as grass-fed land animals for direct sources of the metabolically active **EPA** and **DHA** omega-3 fatty acids (see below)](443).

It's been proposed that a more biologically relevant way to categorize fats (fatty acids) should be based on their impact on health parameters (444). In this classification scheme, for example, the saturated fats myristic and stearic acid are considered **bio-neutral**, whereas medium chain saturated fats, lauric acid (saturated), alpha-linolenic acid and EPA are **beneficially bioactive**, but the palmitic acid (saturated) and the omega-6 arachidonic acid are classified as bioactive fatty acids with one or more **negative** cardiometabolic actions(444).



Dietary responses can be highly individualistic when eating enough food to gain weight, in terms of both fat and muscle mass gain(183-185). This kind of biological interindividual variation suggests that **a wide range of dietary fat intake could prove successful for gaining muscle** (with minimal fat) during the Off-Season, depending on the person. Still, we can explore the importance of dietary fat content by examining the extremes of fat intake overall, as well as the impact of different kinds of fat. To wit, several aspects of our dietary fat are worth considering when it comes to deciding on how much and what kind of Off-Season dietary you'll be consuming:

- In the **context of weight loss**, a low carbohydrate (and thus higher in fat) dietary approach has been associated with a greater improvement in cardiovascular risk profile than a higher carbohydrate diet(445-447). However, at least when studied in type II diabetics and obese subjects, low carb diets do not present a clear, universal, substantial advantage as far as weight loss(448-452) (which of course does not capture body composition). Still, a mechanistic explanation for those studies showing an advantage of a low carb approach(448, 452) may lie in metabolic inefficiencies (e.g., involving gluconeogenesis)(448), such that more energy is lost as heat in processing the calories of incoming food.
- On the other hand, as noted in [Section 4.5](#), when in a **caloric excess**, overeating carbohydrate may produce less gains in body fat due to a greater increase in fuel oxidation(453, 454) and metabolic rate compared to overeating calories in the form of fat(455).
- Generally, some(456-458), but not all(459, 460)

research has shown with lessening **saturated** fat, and **replacing it** with polyunsaturated fatty acids [PUFA, i.e., omega-3 and omega-6 fatty acids, especially omega-3 fatty acids(456)] improves risk of cardiovascular events like stroke and heart attack, and also may improve insulin sensitivity, reduce abdominal subcutaneous fat(461) and promote the accumulation of lean body mass(462). However, **merely supplementing** with omega-3 fatty acids (most commonly as fish oil) **may in and of itself provide no benefit as far as cardiovascular disease risk**, according to a recent meta-analysis of nearly older 78,000 subjects (10 randomized trials)(463). [It's worth noting too, when viewed on a global scale epidemiologically, that a higher fat diet (lower in carbohydrate) seems to carry a lower risk of cardiovascular disease and mortality in general than does eating more carbohydrate(460).]

- **Monounsaturated** fats are also favorable to saturated fats when it comes to insulin sensitivity(464), and consuming more **monounsaturated** fats such as that found in olive oil (in the context of a Mediterranean style diet) may also have a cardioprotective effect(465).

However, coconut oil appears to be a heart-healthy dietary component (466-468), as it's high content of saturated fat come is composed of fatty acids of **medium chain length and lauric acid**(469).

- **Trans fats** [e.g., found (previously) in stick margarine and fried foods] have especially adverse effects on cardiovascular risk profile(456, 470). In fact, increasing *trans* fatty acid intake by just 2% can increase the risk of death or heart attack by ~20-32% (471). Luckily, various policies to ban *trans* fats across the globe have been effective(472), and the Food and Drug Administration of the United States has deemed that partially hydrogenated oils (the primary dietary source of trans fats) are "not generally recognized as safe (473)."

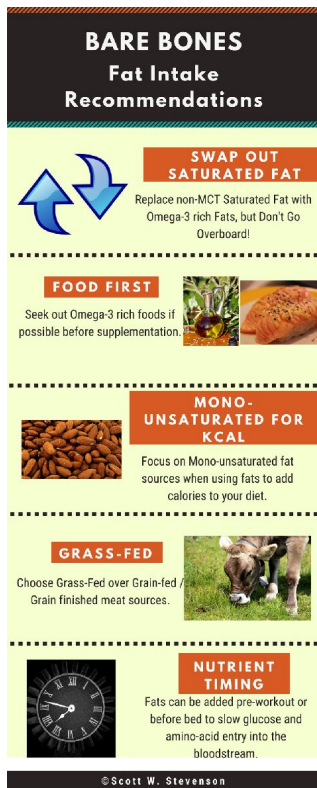
- A minimum amount of dietary **saturated** and **monounsaturated** fat seems necessary for normal testosterone levels (in males)(474), although this exact nature of the effects of different fat sources on testosterone production is complex(475).

- The **two essential fatty acids (EFAs)** are linoleic acid (LA; an omega-6 fatty acid) and alpha-linolenic acid [**ALA** an omega-3 fatty acid found in plants like flax(476)], from which the body can make the bioactive omega-3's eicosapentanoic acid (**EPA**) and docosahexanoic acid (**DHA**) (both found in fish oil). The omega-3's are generally antiinflammatory, whereas omega-6 PUFAs have proinflammatory effects [gamma linolenic acid (GLA) being an exception(477)]. [The proinflammatory dietary arachidonic acid, also sold as a dietary supplement, is found in meat and converted from linoleic acid (478).] For instance, one study demonstrated that one month of daily supplementation with EPA (324mg) and DHA (216mg) reduced both post-damaging (eccentric) exercise soreness and various markers of inflammation(479, 480).
- **ALA**, when consumed in flaxseed, is a "heart healthy" fat source due to the anti-atherogenic actions of its lignans, not it's ALA content (481). Only in impractically large amounts does ALA impact blood lipid profile(482) and it's **conversion to DHA and EPA is poor**(483-486). This leaves marine sources like salmon and, to a lesser degree, grass-fed beef(487) as a preferred way obtain these fatty acids to reap health benefits such as improved lipid profile(482) and insulin sensitivity(488), not to mention reduced cancer risk(489, 490).
- From a bodybuilding perspective, **fish oil supplementation** (on the order of 3-4g/day of combined EPA and DHA) **may** improve the skeletal muscle **protein synthetic response** to amino acids(491-493), which is a fancy way of saying they shift your muscles towards anabolism. [However, this may **not** be true if leucine intake is optimal (494).] Additionally, an evolving body of literature suggests that omega-3 fatty acids have beneficial effects on **satellite cell activity**(495), which is important for muscle regeneration and growth(39, 496-499). On the other hand, DHA and EPA may also have anti-catabolic and antiinflammatory(479, 480) effects in skeletal muscle as well (500) (thus favoring **protein balance overall**), and even improve muscle activation and fatigue resistance during high power output

exercise(501).

- DHA and EPA favorably affect two important fat cell-derived cytokines ("adipokines"): **Adiponectin** and **leptin**. Omega-3 supplementation elevates adiponectin, favoring fatty acid oxidation and insulin sensitivity, and may elevate leptin in (typically leptin insensitive) obese subjects (but possibly lower it in lean individuals which may reflect greater leptin sensitivity)(502).
- In addition to aforementioned beneficial effects on lipid metabolism (503), EPA and DHA induce uncoupling proteins, i.e., have **thermogenic** actions(504-506), which may explain how they can **minimize fat gain**(507, 508). Omega-3 fatty acid supplementation can remediate the loss of insulin sensitivity to a diet high in either sucrose(509) or excessive saturated, monounsaturated or omega-6 fatty acids (510).
- Additionally, fish oil may(493) reduce oxidative stress, although this(511) and other metabolic effects have not been demonstrated universally(512). Fish oil can also reduce pain and inflammation by competitively inhibiting the proinflammatory cytokines and eicosanoids(513). You might be wondering if the form in which the EPA and DHA are delivered plays a role here. Interestingly, **oxidized fish oil** may not adversely affect oxidative stress(512). On the other hand, possibly because of bioavailability(514), health benefits such as improved blood lipid profile and insulin sensitivity are greater when these omega-3 fatty acids are delivered as **phospholipids**, such as those found in **krill oil**(515), rather than as the fatty acid chains of triglycerides.
- A strategy that some coaches employ, such as my friend John Meadows, is to include fats in a **pre-workout meal**, to **slow gastric emptying**(516) and thus meter glucose into the bloodstream(517, 518) while working out. This strategy can also be employed in a meal **before bed**, along with a "slow" protein like casein to provide a more continuous supply of amino acids while sleeping(400). As mentioned above, a nighttime protein feeding such as this can thus enhance protein balance(399) and, most importantly, gains in **size and strength**(401, 402)!

- **Medium chain triglycerides** (MCT's), such as those found in coconut oil(469) are deserving of mention here. Like EFA's, MCT's are heart healthy(466), have a thermogenic effect(519), and are less likely to be stored as body fat(520). As you may also know, medium chain fatty acids are not reliant upon insulin or the carnitine-dependant mechanisms that regulate long-chain fatty acid



movement into mitochondria(521), making them a **more rapidly oxidizable fuel source**(522). (This is why they are often compared to carbohydrate as far as a dietary energy source.)

Dietary Fat Recommendations (and Sources)

As you can see from the above, the kind of fat you consume may dramatically affect your metabolism and health over the long haul. This is not to say that one can't "junk it up" a bit now and again.

Acutely, on the surface in terms of nutrient absorption and general hormonal responses, a single fast food meal might be handled similarly to a meal of similar macros made with more healthy ingredients (523). However, under the hood, a "Western" fast food

diet (high fat, high sugar and low fiber) may **epigenetically program the innate immune system to be proatherogenic** (cardiovascular disease-causing) even after the diet is cleaned up(524-526). Additionally, the thermogenic effect of eating highly processed food (e.g., made with white bread and cheese spread) could be as little as one half of that of equivalent whole food meal that's equally satiating(527). While this might be helpful in gaining weight *per se*, I'm not willing to recommend someone construct a diet of processed food at the expense of healthier eating practices. [It's worth noting – but still not recommended - that a program of high-intensity interval exercise that is extensive and novel enough to produce fitness and body composition improvements also protects against the adverse effects of a fast-food diet on blood lipids and insulin sensitivity (528). So, in some sense, you **can** “out train a bad diet,” but why not simply train just as hard and eat a “good” diet?]

Here are some bare bones recommendations regarding fat intake that can be applied regardless if you take a high fat or low fat dietary approach. (See the Tables Below for some common sources of each fat type.)

- Generally focus on **reducing saturated fat sources**, except for MCT sources like extra virgin coconut oil, replacing them with omega-3 fatty acid rich sources. However, for maintaining normal testosterone levels, keep fat at a minimum of 15%(475) and include some saturated fat(529). Going overboard on this strategy of replacing “bad” with “good” fats can actually reduce testosterone(530)!!!
- A recommended **essential fatty acid intake** of 12-17g of linolenic acid has been put forth(531)]. However [to amplify protein synthesis(491)], you would ideally include direct sources of EPA and DHA(532), which could be had by combining fish oil supplementation and/or consuming fish like salmon [4g in an 8oz serving containing ~1-2g each of DHA and EPA each(533), respectively]. **Simply supplementing** with omega-3 polyunsaturated fatty acids **may not confer the (cardiovascular) health benefits**(463, 534) sometimes associated with greater intake of these fats(446, 535).
- When using fat simply to add calories to your diet, focus on **monounsaturated sources** like almonds or almond oil(536), macadamia nut oil or (extra virgin) olive oil(537), as well as MCT sources like coconut oil

(or MCT oil supplements).

- Choose **grass-fed meat** sources over that of grain-fed animals.
- Consider adding fats pre-workout and **before bed** to slow nutrient absorption (e.g., for glycemic control during exercise or protein hyperaminoacidemia overnight).
- **Walnuts and flax seeds** may also have **cardiovascular benefits** by enhancing endothelial (inner blood vessel lining) function and reducing oxidative stress(538, 539), and even aiding in fat loss(540).

Table 7: Commonly Consumed Sources of Saturated Fats in the United States(541).

Food item (Saturated Fat Heavy)	Contribution to Intake (%)
Regular cheese	8.5
Pizza	5.9
Grain-based desserts	5.8
Dairy desserts	5.6
Chicken and chicken mixed dishes	5.5
Sausage, franks, bacon, and ribs	4.9
Burgers	4.4
Mexican mixed dishes	4.1
Beef and beef mixed dishes	4.1
Reduced fat milk	3.9
Pasta and pasta dishes	3.7
Whole milk	3.4
Butter	2.9
Potato/corn/other chips	2.4
Nuts/seeds and nut/seed mixed dishes	2.1
Fried white potatoes	2

Table 8: Selected Sources of Monounsaturated Fats(542)

Selected Sources of Monounsaturated Fats	
MUFA Source (100g)	Amount
Macadamia Nuts (raw)	59g (76g fat total)
Olive Oil	73g
Sesame Oil	40g
Almonds	33g (53g fat total)
Avocados (Raw, Florida)	5.5g (10.1g fat total)

Table 9: Selected Sources of Alpha-Linoleic Acid (ALA) (542, 543)

ALA Source	ALA (g/tbsp)	ALA (g/100g)
Pumpkin seeds	0.05	0.18
Olive oil	0.10	0.76
Walnuts, black	0.16	0.55
Soybean oil	1.23	9.05
Rapeseed oil	1.30	9.57
Walnut oil	1.41	10.40
Flaxseeds	2.35	8.29
Walnuts, English	2.57	9.08
Flaxseed oil	7.25	53.30
1 Tbsp oil = 13.6 g; 1 Tbsp seeds or nuts = 28.35 g.		

Table 10: EPA and DHA Content (100g) and Ratios in Selected Fish(532, 542) and Beef(544, 545) Sources

<u>EPA and DHA Content (100g) and Ratios (Fish & Beef)</u>			
Fish (100g raw)	EPA(g)	DHA(g)	EPA:DHA
Atlantic cod	0.06	0.12	0.5
Pacific cod	0.08	0.14	0.57
Atlantic Mackerel	0.9	1.4	0.64
Wild Atlantic Salmon	0.32	1.11	0.29
Farmed Atlantic Salmon	0.86	1.1	0.48
Grass-Fed Beef	.013 - .025	.002 - .004	~1 - 10
Grain-Fed Beef	.013	.004	~1 - 3

Carbohydrate – Did Someone Say Sorbet?...

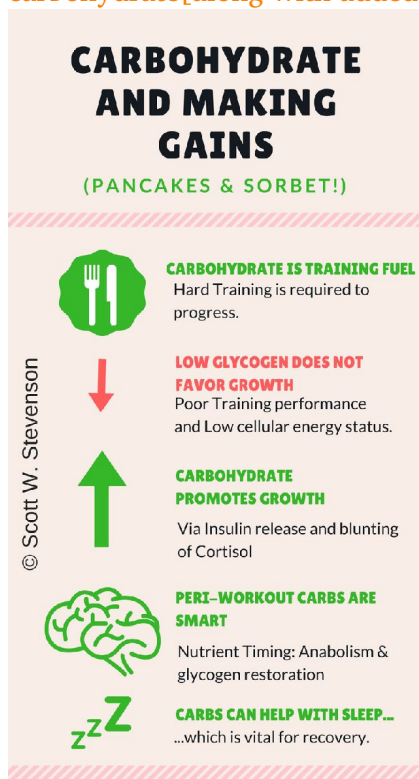
Aside from being the cornerstone of most Off-Season diets, and perhaps the tastiest of food components, there are indeed non-gluttonous reasons for a bodybuilder to consume carbohydrate (i.e., **good excuses to eat more pancakes and sorbet**).

- There is no doubt that glycogen is a primary fuel source when you're weight training (hard) in the gym(546-549). So, obviously, this fuel needs to be replenished. Indeed some(550, 551), but not all(552) evidence suggests that supplemental carbohydrate during exercise may be **beneficial for performance**(553), perhaps by slowing the progressive loss of glycogen(554) assuming it's in adequate supply.
- On the other hand, **low glycogen levels** over a series of days have been implicated as an underlying cause of overtraining(555). Indeed, low glycogen impairs short-term maximal muscle performance, e.g., during a single 30s all-out bout (556), and thus is likely cause of fatigue during resistance exercise(557). Also, training

with low glycogen can increase protein oxidation during resistance exercise(558) and **might** even limit the anabolic response to the training stimulus(559, 560).

- Naturally, carbohydrate will increase **insulin levels**, especially high glycemic index carbohydrates, and insulin action strongly determines the rate of muscle glycogen synthesis(561, 562). So, carbs are anabolic in terms of glycogen and may well be in terms of muscle protein synthesis(563) as long as insulin increases blood flow(564). At a bare minimum, the evidence is strong for **insulin's positive effect on protein balance** by **inhibiting muscle protein breakdown**(405, 565).
- The **high cost of tissue growth**(566-569) can be provided by carbohydrate. Because muscle growth is foundationally a matter of protein balance(405, 425), **insulin's overall effects on synthesis and breakdown may actually stimulate muscle growth primarily by reducing protein turnover**, i.e., making the process more efficient(570), i.e., by improving what has been called nitrogen balance protein efficiency ratio when measured directly(571).
- Consuming carbohydrate before and during (as well as after) a workout will limit cortisol release (154, 155), and doing this repeatedly (with peri-workout carbohydrate supplementation, e.g., 50 grams of a readily absorbable carbohydrate) is strongly correlated with training-induced muscle fiber growth (155). In other words, **peri-/intra-workout carbs**, in and of themselves, promote **muscle growth**(155).
- Both **carbohydrate amount**(572, 573) and **overall energy intake** are important for **glycogen restoration**(574), as well as the **timing** of carbohydrate intake around a workout(575). So, when energy intake is low, ensuring adequate dietary **peri-workout carbohydrate** (e.g., but cutting down on fat intake) is a smart strategy. Indeed, the post-resistance exercise energy demands(576, 577) and muscle damage(578-580) may be so great that glycogen levels may actually continue to decline in spite of copious carbohydrate intake (581). On the other hand, **delaying postexercise carbohydrate intake** may

result in missing the opportunity for the most rapid rates of replenishment(582). So, to most efficiently replenish glycogen, especially if carbohydrate intake is suboptimal(583), it's pretty clear that post-workout (which could be intra-workout for muscles trained early in a session) is a smart time to take in carbohydrate[along with added protein(441, 584)].



- Lastly, a carbohydrate meal before bed may **help you fall asleep** more quickly(150-152), which can be an issue if you've really cranked up the dial on your Off-Season training(153) (as well as when otherwise limited carbohydrate, e.g., Pre-Contest) or are using stimulatory "fat burners" Pre-Contest, for instance.

How Many Carbs Do I Get?

In the context of the Off-Season, I hold as a general rule that carbohydrate intake should follow as “as needed” rule of thumb, i.e., **increase or decrease in parallel one's overall activity levels**. The energy cost of converting carbohydrate to (body) fat is intermediate to that of protein (high) and fatty acids (low)(569, 570), and as mentioned above, bodybuilding training means extensive use of

glycogen(546, 547) which gives us some metabolic lee-way when it comes to (over)consuming carbohydrate(453). Still, as many of you know, excessive carb intake is a great way to gain body fat(585), and much of this may be due to one's genetic proclivities for gaining body fat(183, 586).

So, I don't hold to any particular hard and fast rules for the amount of carbohydrate one should consume in the Off-Season. Indeed, there is poor argument for the absolute **nutritional** need (whatsoever) for digestible carbohydrate in the diet, aside from the fact that without it, obtaining fiber and micronutrients (think fruits and vegetables here) would be difficult without supplementation (587). However, as you can see from the bulleted list in the previous subsection, there is ample reason to include carbohydrate from a muscle building standpoint. Thus, **as your own coach**, you will have to craft your own strategy for employing carbs as an Off-Season tool for gaining muscle, employed in a manner that does not lead to unnecessary (or for you, unacceptable) body fat gains. Still, here are a few **more specific considerations** (see above for rational and related references) you can employ in constructing how, when, why and what of your carbohydrate intake (in the Off-Season).

- Include carbohydrate intra-and post-workout, preferably a **high glycemic index (GI)/fast gastric emptying carbohydrate** source (~50-100 +g). Some carbohydrate sources I've found effective intra-workout include UltraFuel, Vitargo, Karbolyn, Karboload (www.truenutrition.com) and of course, **highly branched cyclic dextrins** (HBCDs), which are rapidly absorbed and tend to cause minimal gastric distress(588, 589), and even maltodextrin (whereas glucose/dextrose is often bloating). (Although a high molecular weight carbohydrate, **waxy maize** may have a low GI and not be a good choice in this context(590).] (See more on finding the best carbohydrate sources for you in the subsection below.)
- Also, include **pre-workout carbohydrate if you feel this helps neurologically/psychologically**. Others may get drowsy from carbohydrate, which is unlikely to help in psyching up for a big day in the gym.
- Consume carbohydrate with the goal of **replenishing glycogen** used during training as well as matching daily energy/**activity requirements**. This will be guesswork for nearly all of you reading, but will largely depend overall on the amount of "work" you perform

during exercise (sets x reps x load)(548), as well as how much glycogen (and muscle triglyceride) you have stored(591). Carbohydrate intake would thus vary on a daily basis, i.e., less on non-training (rest) days and training days when only smaller muscle groups are trained. (I outline several nutrient timing approaches based on this premise in my book [Fortitude Training®](#).)

- As a general rule, **avoid training a given muscle group directly more than twice without replenishing muscle glycogen**. Doing so can lead to a “bonk” phenomenon where your training performance drops off, especially at the end of your sets. (You’ll also find it difficult to get a pump in the gym. For those doing Fortitude Training®, metabolic stress during Pump Set and Occlusion stretches will be diminished.) Training while consuming minimal dietary carbohydrate may be necessary during low-calorie/low-carbohydrate Pre-Contest dieting, but is counterproductive to making gains in the Off-Season when you should be pushing performance limits in the gym *en route* to new muscle size.
- Generally, after meeting protein and fat needs and *in lieu* of health concerns (e.g., diabetes mellitus, celiac disease, etc.), **consuming carbohydrate to create an Off-Season caloric excess** is a very common way to make great gains. The following caveats apply: Eat as much carbohydrate as you can, but 1.) **Don’t gain fat at an unreasonable rate** ([Refer to Section 1.3](#) on setting Off-Season goals that will still allow you to drop Off-Season body fat before stepping on stage); 2.) Avoid suffering **gastrointestinal issues** (bloating, diarrhea etc.) from excess carbohydrate intake; 3.) Consider dietary fat (see above) in addition to **adequate carbohydrate** if you have trouble using carbs as a primary source of excess calories (larger bodybuilders or those with poor appetites may have no choice 4.) **Large meals before bed may help improve sleep quality** and/or onset, so including carbohydrate at this time (including milk, which has several sleep-promoting components) may serve both as a nighttime treat and recovery-promoting strategy (592).

See the [References\(593\)](#), or simply google “International table of glycemic index and glycemic load values” for a [paper](#) containing an extensive Table listing dietary carbohydrate sources with various properties that can be useful in scenarios such as post-workout meals (e.g., high glycemic index and glycemic load), or when dieting Pre-Contest (those with high fiber), *etc.*

However, it's especially worth noting that **even the most basic measure of carbohydrate assimilation – glycemic index (GI) – is subject to incredible (interindividual) variability**. Indeed, one study found when comparing white bread vs. glucose that the within-individual differences in glycemic index were more than twice as great as the variability across individuals([181](#)). **In other words, your personal reaction to even the most basic of carb sources([180](#)) may be very different than those of another**. Additionally, these responses may change over time (in a matter of days and weeks) as your diet progress or your training status changes([594](#)), and/or in conjunction with changes in the microbiome of your gut([182](#)). Also, don't make the mistake of assuming the GI of all foods of the same name is the same. For instance, the GI of various kinds of rice (waxy rice, brown rice, rice cakes, etc.) varied from 64 – 100 in one study ([595](#)).












Still, for the sake of being informed, it's worth understanding the main measurable variables when it comes to carbohydrate assimilation:

- **Glycemic Index (GI):** A measure of the relative elevation of blood sugar for a standardized amount of carbohydrate [typically 50g([596](#))] compared to the same amount of glucose or white bread, typically measured as an "area under the curve." A GI > 100 indicates a higher blood glucose elevation than the rapidly absorbed (reference) glucose or white bread sources.
- **Glycemic Load (GL):** GL could be considered the physiologically relevant measure, as it is a multiple of GI and the amount of carbohydrate in a "typical" amount of a given food. A carbohydrate dense, high GI food (e.g., dried dates) would contain more carbohydrate in a typical serving and thus produce a higher glycemia (blood sugar elevation) generally. The opposite would hold true for a low carb density food like watermelon ([593](#)). For a complete list of GI and GL, see the Table at the end of [this article\(593\)](#).
- **Insulin Index (II):** Like GI, this is a measure of the

extent of insulin elevation. In comparing in GI and II, one can see that high GI foods tend to have a high Insulin index, but also that (fatty) snacks such as ice cream, candy bars, and cookies tend to also illicit a disproportionately greater insulin release relative to glucose elevation in comparison to of white bread. This can also be expressed as a high insulin area under the curve (AUC) relative to the weight of the food itself (597).

The bottom line of the above is that you may need to experiment with foods that suit you in terms of digestion and rapidity of absorption (which can easily be assessed with a store-bought glucometer) during different periods of the bodybuilding year and under different circumstances (e.g., post-workout, when pushing calories very high, for rapid Pre-Contest carbohydrate loading, to avoid blood sugar fluctuations, etc.). Eliminating those carbohydrates don't work for you can be one of the most crucial steps in finding that carbs that work best. In the section below, I'll dig more of the not-so-great carbohydrate sources when it comes to gut health.

Carbs!

CARBOHYDRATE DO'S & DON'TS	
	
 INTRA/POST-WORKOUT High GI, easily digestible...	 TRAIN >2X WITHOUT REPLENISHING GLYCOGEN
 PRE-WORKOUT? If helpful...	 GAIN EXCESSIVE BODY FAT
 MATCH INTAKE TO GLYCOGEN USE / ACTIVITY	 DON'T IGNORE GI ISSUES
 USE CARBS AS A SLEEP AID IF NEEDED	 DON'T IGNORE ANTI- NUTRIENTS
 CONSIDER LOW FODMAP APPROACH	

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Carbs You May Not Care for: AntiNutrients, Gluten and FODMAPs

Gut health is paramount to bodybuilding success, especially when attempting to assimilate nutrients into new muscular tissue. (An unhealthy gut will quickly make it unfeasible to eat enough of the right foods to make muscular gains.) **Those of you reading this with medical issues such as Crohn's disease, irritable bowel syndrome, celiac disease, salicylate hypersensitivity, as well as food allergies, should take those concerns up with the**

appropriate licensed medical professionals. (This section is **not intended** to provide you with the tools to make a medical diagnosis, but instead, bring your attention to these matters.) Still, I'd like to mention some food components (often found in carbohydrate-containing sources) that can be detrimental to gut health. Note that I touch on pre-and probiotics in [Section 3.4](#), so I won't cover them here, but, as aspects of your diet to consider when **troubleshooting** gut health issues, I'd like to make antinutrients, gluten, food intolerance, and the dietary content of FODMAPs (Fermentable Oligo-, Di- and Monosaccharides and Polyols) (better) known to you:

- **Antinutrients** aka antinutritional factors are "those substances generated in natural feedstuffs by the normal metabolism of species and by different mechanisms (e.g., inactivation of some nutrients, diminution of the digestive process or metabolic utilization of feed) which exert **effects contrary to optimum nutrition**(598)" of a given animal. (Naturally, we're worried about those things that are antinutrients to humans specifically, in this book at least.) Antinutrients include molecules such as saponins, tannins (polyphenols), flavonoids, alkaloids, trypsin (protease) inhibitors, oxalates, phytates, haemagglutinins (lectins), cyanogenic glycosides, cardiac glycosides, and coumarins and gossypol, on top of other pesticides and preservatives that may be harmful (599) and other toxins produced by the food (plant, etc.) itself(600). However, the devil's is in the dose, as some of these very same chemicals, mostly found in plants, can have health-promoting effects in smaller amounts(601). **Additionally, heating (cooking), soaking, sprouting, fermenting and/or mechanically processing (e.g., dehulling) of the antinutrient-containing food often neutralizes these components**(602, 603). Food toxicology is a topic far beyond the scope of this book, but here are some examples of foods (**this list is not exhaustive**) you might be wary of if you are having GI distress(600):

- **Potato sprouts** contain toxic glycoalkaloids not destroyed by cooking.
- **Parsnip peels** contain toxic furocoumarins.
- **Lectins** are found in beans such as (red) kidney beans and lentils and should be removed by soaking

and boiling before cooking. Peanuts also contain lectins(604), which may affect some more than others (605).

- **Apple and pear seeds/pits** contain a cyanogenic (cyanide forming) glycoside that can be fatal.
 - **Fish oil** should be certified mercury free.
 - **Wild mushrooms** (I'll presume caution here is common sense.)
 - **Phytic acid** found in soy(606), **corn** (maize) and **cereals** can reduce the bioavailability of minerals such as Zn, Ca, Fe, Cu, Mg and impair protein and carbohydrate utilization(436).
 - **Trypsin (digestive enzyme) inhibitor** content found in soy products(436, 606). As with phytic acid, soaking soybeans (12-14hr) does not reduce trypsin inhibitor action(607).
 - The **polyphenols (tannins)** mentioned below having health benefits (e.g., as found in green tea) are widely distributed in the plant kingdom, found in peas, barley, millet, chickpeas, fava beans, etc (436). Tannins are heat-stable (not broken down by cooking) and in higher doses, can **impair protein digestibility and even be toxic**(600, 601).
 - **Fungal toxins (mycotoxins)** that can affect (contaminate) cereals, nuts, fruit and dried fruit, coffee, cocoa, spices, oilseeds, and milk.
 - **Lysinoalanine (LAL)** found in **milk products, chicken meat**, soy protein isolate [and soybeans depending on processing(606)], and casein protein may potentially impair protein digestibility and be toxic to the kidneys(436, 608).
- **Gluten** is found in wheat, barley, and rye as a mixture of glutenin and gliadin proteins(609). Forms of wheat like durum, spelt, kamut, einkorn and bulgar, and wheat flours like semolina and farina are glutinous, as is triticale and oats in some cases (there is a possibility of wheat cross-contamination) (610). [**Sprouting of wheat reduces but does not eliminate gluten content**(611, 612).] Gluten is linked to the well-known autoimmune disorder celiac disease, as well as wheat

allergy and other disorders, and what has been called **non-celiac gluten sensitivity (NCGS)**. A recent report comparing the impact of gliadin on duodenal samples from patients with celiac disease (active and in remission), NCGS and non-affected controls found **that all individuals (symptomatic or not) suffer some increase in intestinal permeability** upon gluten (gliadin) exposure that graded with symptomatology (613).

■ Still, NCGS has made quite a buzz in the nutrition world in the past few years, as the evidence of this phenomenon has come under fire(614-616):

- Essentially **NCGS is a syndrome of gastrointestinal symptoms** such as abdominal bloating and pain, gas, diarrhea, nausea and other IBS-like symptoms, as well other symptoms like mental fogginess, lethargy, headache, joint and muscle pain and a general lack of well being(617). Currently, a diagnosis of NCGS is ultimately based on subject report, as **there is no biomarker of NCGS** as of yet, which would be established via a double-blind , placebo-controlled gluten challenge diet (where subjective measures would corroborate the inclusion of gluten in the diet) (614).
- As of this writing, the reports of a single group of Australian researchers have demonstrated the **complexity of NCGS**. In one study of subjects without celiac disease(618), they documented that changes in NCGS symptoms overlapped placebo and glutinous diets, without any serological indication of celiac disease, intestinal inflammation or permeability. However, in a follow-up study, subjects who had **NCGS were placed on a low FODMAP diet (see below) for just 2 weeks and then gluten (or placebo) was re-introduced (in a blinded fashion) without any recurrence of NCGS symptoms**, ruling out a gluten specific effect, and implicating FODMAPs in the symptomatology of NCGS.
- So, due to the lack of definitive evidence that gluten per se is the issue, distinct from the effect of FODMAPs, scientists in this area have proposed re-

naming NCGS phenomenon, e.g., “wheat intolerance syndrome”(614) or “non-celiac wheat sensitivity”(615), although this terminology raises questions given the **unknown etiology** of what is most recently simply referred to as NCGS(616).

- **Food intolerance** is a kind of **food sensitivity** without the marked immunological (immunoglobulin) component of an outright food allergy(619, 620). [FYI, irritable bowel syndrome may be due to allergy and/or food intolerance(621).] Food intolerances may be due to pharmacological effects of food (e.g., as with tyramine in cheese or caffeine in coffee), the rascally NCGS (see above), or some form of enzymatic/transport deficiency (e.g., lactase deficiency causing lactose intolerance)(619), and perhaps even a “leaky gut” that permits the unwanted entry of gut contents into the bloodstream(622). Common food intolerances include: Cereals, cabbage, onion and peas, dairy products, spices and fried/fatty foods and coffee(619). (Sound familiar?...)

- While the **exact mechanisms of food intolerances** are **not entirely clear** [such that the term itself has even been called into question(623, 624)], low FODMAP diets are quite effective in treating them (including IBS and lactose intolerance)(619, 625-627). I’ve not been able to uncover any scientific evidence that repeatedly eating the same food (food-jagging, such as eating chicken breast daily for years on end) can create a food intolerance (to that food), but I suspect that poor dietary diversity may impact the gut microbiome(628, 629), which is implicated in food intolerance(626, 630). In many cases, a simple, first (common sense) step to remedy such an apparent intolerance could be to add variety to one’s diet generally and, of course, find a suitable substitute for the offending food item. (If the thought of doing so strikes you with marked food “neophobia” (fear of something new), please do not hesitate to (re)consider this option, and do something about the possibility that disordered eating could be impacting your overall quality of life.)

- FODMAPs include Fructo-and galacto-

Oligosaccharides (aka fructans and galactans), **lactose** (a Disaccharide made from glucose + galactose), **fructose** (a Monosaccharide) And the **Polyols** (aka **sugar alcohols** such as sorbitol, mannitol, xylitol, maltitol and erythritol). The FODMAPs are generally poorly absorbed (due to lack of digestive enzyme activity and/or transport activity), osmotically active (thus pulling fluid to them causing diarrhea), and rapidly fermented by bacteria (in comparison to dietary fiber) creating intestinal gas (especially hydrogen)(630).

- You can find lists of high and low FODMAP foods online and in books(631), but generally, to follow a low FODMAP diet, you'd **avoid high FODMAP foods** such as fruits **high in fructose**, **milk, yoghurt and cheese**, certain **vegetables** (including **broccoli, garlic and onions**), **glutinous cereals**, **lentils** and **some beans** and **artificial sweeteners**. Instead, you'd eat low FODMAP fruits such as grapes, honeydew, citrus fruits, and berries, seek out dairy substitute products (e.g, possibly sorbet rather than ice cream), have carrots, eggplant, chives and bok choy, gluten-free bread products, and choose good old glucose(-based) or table sugar over artificial sweeteners ending in "-ol (630). Note, of course, that a food may disagree with you (for reasons you do or don't understand), even if it is low in FODMAPs, so finding a given food on a low FODMAP list is not necessarily a good reason to justify eating it. That being said, here's a brief list of high FODMAP items and alternatives that are low in FODMAPs(625, 632):

Table 11: High FODMAP Foods and Low FODMAP Alternatives(625, 632).

FODMAP	Higher in FODMAP(s)	Lower in FODMAP(s)
(Excess) Fructose	Concentrated fruit sources , large servings of fruit, dried fruit, fruit juice, apple, clingstone peach, nectarine, grape fruit, mango, nashi pear, pear, sugar snap pea, canned fruit in natural juice, watermelon; Sweeteners : fructose, high-fructose corn syrup	Fruits : Banana, blueberry, cantaloupe, grape, grapefruit, honeydew melon, kiwi, lemon, lime, orange, passion fruit, raspberry, strawberry, tangelo, tomato; Sweeteners : Glucose, golden syrup, maple syrup; any sweeteners except polyols
Lactose	Milk and Dairy : Regular and low-fat cow, goat, and sheep milk; Ice cream, Sherbet Yogurts : Regular and low-fat yogurts Cheeses : Soft and fresh cheeses (mascarpone)	Milk and Dairy : Lactose free milk, rice milk, almond milk, etc.; Gelato, Sorbet (from low FODMAP fruits) Yogurts : Lactose-free yogurts Cheeses : Hard cheeses (cheddar, swiss, mozzarella, etc.)
Oligo-saccharides (Fructans and/or Galactans)	Vegetables : Artichoke, asparagus, beetroot, broccoli, Brussels sprout, cabbage, fennel, garlic, leek, okra, onion, pea, shallot Cereals : Rye and wheat cereals when eaten in large amounts (e.g., biscuits, bread, couscous, crackers, pasta); Legumes : Baked bean, chickpea, lentil, red kidney bean Fruits : Custard apple, persimmon, watermelon, white peach	Vegetables : Bamboo shoot, bok choy, capsicum, carrot, celery, chives, corn, eggplant, green bean, lettuce, parsnip, pumpkin, spring onion (green part); Garlic-infused oil Cereals : gluten-free and spelt bread/cereal products, quinoa pasta, rice noodles; Legumes : Canned lentils Fruit : Tomato
Polyols	Fruits : Apple, apricot, avocado, cherry, longon, lychee, nashi pear, nectarine, peach, pear, plum, prune, watermelon; Vegetables : Cauliflower, mushroom, snow pea; Sweeteners : Isomalt, maltitol, mannitol, sorbitol, xylitol, and other sweeteners ending in "-ol"	Fruits : Banana, blueberry, cantaloupe, grape, honeydew melon, kiwi, lemon, lime, orange, passion fruit, raspberry; Vegetables : See above; Sweeteners : Glucose, limited sugar (sucrose), non-polyol sweeteners.

What about Alcohol (The “Other” Macronutrient)?

Alcohol (ethanol) is a common fixture in Western society and has an intimate social relationship to sports and athletic participation(633). Still, you may be like many bodybuilders I know (including myself) who rarely if ever drink [which agrees with research in this area(158)]. Drinker or not, you likely know full well that alcohol does not behoove your efforts for gaining muscle mass, so

I'll not beat you over the head with **too much** information. We do know, in fact, that alcohol induces pathology in both skeletal and heart muscle(634, 635), in part by blunting protein synthesis at its roots(636). This holds true as well when it comes to the precious increase in protein synthesis we seek after each training session, a negative effect not undone by even by consuming protein alongside the alcohol(637).

Can you get away with a few drinks and still make muscular gains? Naturally, being intoxicated (while lifting) is unlikely to improve gym performance due to the impact of ethanol on a number of physiological systems (638). In terms of recovery and the muscle growth process, the old saying that "the devil is in the dose" applies here as to whether one's drinking habits will sabotage gains. There seems to be a dose-dependency of the adverse effects of alcohol on metabolism in general(638): The more alcohol consumed, the greater the (negative) effect on muscle growth.

Consuming a "**low dose**" of alcohol after a muscle-damaging exercise bout [0.5g/kg or 50g of alcohol for a 220lb bodybuilder – about 3 drinks (639)] may not affect recovery (as measured by strength measures)(640). However, doubling this amount (to roughly a 6 pack) is enough to exacerbate the impairment brought on by a brutal training session(641).

So, for some of you reading this, it may very well be possible that whatever lifestyle benefits (including relaxing) you derive out of (light) recreational drinking may foster better progress in the gym. However, realistically speaking, anything more than small or infrequent alcohol consumption would probably run counter to the goal of achieving one's maximum muscular potential.

Water Intake – How Much, When and Why?

Aside from giveaways muscularity and perhaps a fanny pack and/or cooler in tote, the most stereotypical sign of a bodybuilder is the gallon jug of water that never leaves his/her side. Is this practice potentially really helpful or necessary for bodybuilding, or perhaps more so just a subcultural behavior, adopted for unconscious reasons and perpetuated by "monkey see, monkey do," competitive tendencies?

Water fills quite a few physiological functions in the body. Here's a very short list:

- Constitutes more than half of the body's mass and nearly $\frac{3}{4}$ of the fat-free mass of the body(642)
- Serves as the liquid medium within which our metabolism (biochemical and enzymatically driven

reactions) takes place(643).

- Is the fluid component of the cardiovascular system for the delivery and removal of nutrients, hormones, and waste products(85).
- Provides for thermoregulation in the cold and heat via blood flow redistribution and sweating(644-648).
- Is the determinant of cellular hydration state, which impacts protein metabolism (both catabolism and anabolism)(649, 650).
- Is what gives us the “muscle pump,” a potential contributor to muscle growth adaptations to resistance training(59, 61).
- Is vital for proper kidney function, i.e., glomerular filtration rate and absorption and reabsorption processes(85).
- Is the medium within the gut that determines the relative concentration of nutrients, thus affecting digestive and absorptive processes (at rest and during exercise) (651, 652).

So how much water intake is enough ?...

Certainly, fluid consumption would match losses due to thermoregulation when exercising in the heat(648). Additionally, electrolytes are lost in sweat(648) and replacing these helps maintain hydration(653, 654) On the other hand, excessive intake of hypotonic (low electrolyte content) solutions, e.g., when exercising in the heat, can actually lead to water intoxication(655) which in extreme circumstances can be deadly(656).

All sources of loss and gain considered, the majority of water balance revolves around sweat rate(648). Most of you reading this don't train in a hot (non-air conditioned) gym, but some of you (I'd even say the lucky ones, as hot gyms are often great training environments) actually may, so hydration would be at a premium for you. Sweat rates can climb to nearly 2 liters/hour, with daily losses being double that(648). (FYI: 1 gallon \approx ~3.8 liters \approx 8.3lb.) As noted below in [Section 4.8 on Peak Week](#), in lieu of more scientific measures, one can use body weight as a rough indicator of hydration status under conditions of large fluxes of body water. Additionally, urine output (and color) can be measured against water intake as an indicator of fluid status(648).

So, is the gallon jug really necessary?... Well, it's been

estimated that, **on average**, the adequate intake (AI) needed to balance water losses is ~3.7liters per day(657), almost exactly one gallon. Caffeine can affect water balance [due to its diuretic effect(86)], but its overall impact (given reasonable doses) is thought to be minimal for most folks(648). This is not the case for alcohol, however(648).

While you're exercising, to prevent loss of performance, it's wise to prevent body weight losses greater than 2% (~4lb for a 220lb bodybuilder) via fluid consumption, ideally with something palatably flavored with carbohydrates (to increase consumption)(648) that also includes electrolytes(653, 654). If you sweat a lot during training, a postexercise weighin that dictates fluid consumption makes sense, with the goal of consuming about 1.5L of fluid for each kilogram (~50% more in water weight than actual weight loss). Typically, though, the body's homeostatic mechanisms (thirst) will ensure you re-hydrate adequately, and food is an adequate source for postexercise replacement of lost electrolytes(648).]

It appears that the average human kidney can excrete ~0.9 L of fluid per hour(658). This would equate to about 4 gallons of water during a 16hr waking day, or four times typical water losses (mostly via sweat and urine), or twice what you might lose if performing hours of strenuous exercise in the heat. So, if you're filling your gallon jug repeatedly, between conspicuous, hurried, overly frequent trips to the bathroom, you're probably drinking too much water. On the other hand, being sure to consume about a gallon a day, plus replacing fluid losses during exercise, and paying keen attention to thirst and signs of hyper-or hypohydration (e.g., nighttime edema or cramps) will serve most quite well. (NOTE: An exception here can be those who have been prescribed medications such as diuretics for the treatment of hypertension. **DISCLAIMER: As with all statements in this book, the above does not constitute nor should it serve as a replacement for medical advice.**)

FACTOIDS ABOUT WATER

1

WE'RE MOSTLY WATER

50+% of Body Mass and nearly $\frac{3}{4}$ of Fat Free Mass.

2

METABOLISM

Medium for biochemistry.

3

CARDIOVASCULAR

Fluid for Delivery of fuel, hormones, etc. & Waste Removal

4

THERMOREGULATION

Via sweating & redistribution of blood.

5

CELL HYDRATION

Impact Anabolic / Catabolic State.

6

THE PUMP

Without water, there is no pumpatude!

7

KIDNEY FUNCTION

Solvent for kidneys' filtering functions.

8

GUT

Governs GI emptying & absorption.

9

AVERAGE OF ~1GAL / DAY

Guideline: Replace 1kg lost during exercise with 1.5L water.

10

KIDNEYS CAN EXCRETE ALMOST 1L/HR

A healthy reserve capacity for most situations.

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Thus, the gallon jug is likely not a bodybuilding necessity, unless perhaps you live, work and train in a hot and/or humid, non-air conditioned environment without easy access to healthy, clean drinking water, and are an extraordinarily large individual. On the other hand, the gallon jug certainly makes it easy and convenient to keep track of fluid intake while having some assurance as to the quality of your water, and it might even symbolize status to some degree (be that as it may).

3.3 Off-Season Dietary Adjustments: Guideposts, Progressive Eating, Biofeedback (& an Example)

So, when it comes to making the daily or weekly changes in diet to progressively inch body weight and fat-free mass (muscle mass) upwards, being your own coach may be **as much an art, as it is a science**. Recall the Three Rules from the [start of this Chapter](#):

Rule #1 - One Change at a Time.

Rule #2 – Make Small Moves: Get the Most out of the Least.

Rule #3 – Do your best to ensure a Nutritionally Complete Diet at All times.

However, [biological interindividuality](#) (see [Chapter 2 Special Section](#)) and personal preferences will come into play here to determine the “artistry” of how your Off-Season diet manifests when applying these three rules.

- Naturally, your genetic proclivities will determine how well caloric intake is “**partitioned**” to **fat-free mass vs. fat mass**.
- There will be variability as to how quickly caloric intake must be raised to **ensure forward-moving progress**.
- Each person will have his/her own personal limit in terms of **acceptable body fat**, at or above which the desire to increase bodyweight and the success at doing so seem to wane in parallel. (Self-image, comfort levels, cost of new clothing, romantic partner preferences, various lifestyle-related factors, including work culture, *etc.* will limit how much body fat one will/is willing to accrue. In addition, those of you who work in the fitness industry may be somewhat constrained, especially in the age of social media, to **maintain a fit, lean look in order to be competitive** in the personal training, modeling and company representative marketplaces.)
- The **above 3 factors** will generally determine how fast one can gain muscle mass with an acceptable tradeoff in fat gain, in the overall context of gaining enough “new” muscle to improve during the Off-Season (before dieting

down again). All of this, of course, must occur while staying within shooting distance to have a reasonable short Pre-Contest period. (**Be SURE TO REVIEW Section 1.3 – COMMON Goal #1** for more on moving up a weight class.)

- Generally, one should eat to maintain insulin sensitivity as noted in Section 3.7 on maintaining Off-Season insulin sensitivity further along in this Chapter. This would generally mean not “overeating” by spreading out meals (higher meal frequency), favoring low glycemic carbohydrate sources but also employing nutrient timing (to match nutrient intake with exercise-induced increases in insulin sensitivity)(659).

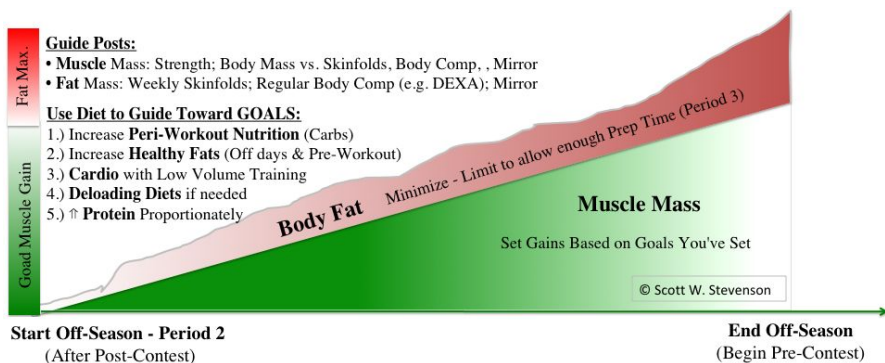


Figure 9: Off-Season Progress Illustration, Guide Posts and Goal-Directed Strategies.

Off-Season Dietary Adjustments: Guideposts for Assessing Progress

As noted at the start of this Chapter (Section 3.1), basic guideposts such as your strength, body mass (scale weight), skinfold thicknesses, and the mirror are vital to ensure you're on track to reaching your goals. Adjusting one's diet (whether Off-Season or Pre-Contest) is a **juggling act** that **also** includes the variables of newly introduced supplements, removal of supplements, changing one's training strategies, recovery, and all the other bodybuilding puzzle pieces. The important point here is to monitor gains and **adjust using the changes you see and measure in your physique**, rather than use some sort of pre-formulated ("canned") diet that does not fit one's current state of improvement or lack thereof.

Below are ways you can get a sense for your trajectory of **muscle gain** relative to **fat gain** during the Off-Season.

- **Strength/performance gain in the gym** is a surrogate for muscle gain. Of course, unless you are perhaps powerlifting in the Off-Season, there is little reason to perform one-repetition maximum efforts. Instead, “strength” can be assessed **with a logbook and multiple-repetition gym personal records** during training with heavy compound lifts like barbell squats, presses and deadlift varieties. If you're getting stronger of your go-to lifts, and are stronger at a given body weight compared to years past, these are obviously good signs. With Fortitude Training®, for example, the logbook is essential for monitoring training weight during "Loading Sets" and Muscle Rounds, as progressive overload is a key driver of muscle growth (660).
- How much **skinfolds** are changing, and which of these are the most indicative of overall body fat and those “**stubborn**” fat areas (e.g., abs, low back and glutes)? (How high can you reasonably allow these skinfolds get before you begin a Pre-Contest diet?... A concrete answer to the question may only come with time and experience. Picking your own personal set of skinfold sites is covered above in [Section 1.3](#) where I consider the concrete goal of adding size and moving up a weight class.)
- How much is **body weight** changing? Is there a **pattern of fluctuation** throughout the week, e.g., based upon using a nutrient timing-based dietary strategy that includes “**training day diet**” vs. a “**non-training day diet**?” If so, it's vital to do your progress assessments on the **same day of the week**, preferably **in the morning** upon waking and **after** using the **bathroom** (voiding). [Interestingly, I've found that it's not uncommon for muscle growth to seemingly come in short (several days long) **spurts**, interspersed by days or weeks of what seems like relative stagnation. If you can pinpoint what precedes or accompanies these growth spurts (lifestyle, diet, training, etc.), you may be able to **unlock greater rates of progress**. As an extreme example, you might find that you make a quantum leap forward over the course of a prolonged 4 day holiday – such as Thanksgiving in the United States – where food and rest predominates your daily

activities, which obviously suggests that you should eat more and train less (or perhaps de-load more often).]

- How well do the above corroborate **what you see in the mirror**? Is your physique getting "sloppy" relative to the changes that might look good on paper, or perhaps the opposite? Are you happy with progress even though skinfolds have increased substantially?
- Lastly, you can indeed perform a **body composition estimation** such as DEXA, which can be used to create a custom regression equation, fitting your own skinfolds with this estimation (Again, see [Section 1.3](#) above covering the goal of adding size and moving up a weight class.)

The simple fall-out from the above is simple: Generally speaking, one would eat more when gains in muscle mass are not forthcoming and perhaps reduce calories if body fat is accumulating at an alarming rate. Again, the big picture for how you would proceed would be based upon your Off-Season goals.



Figure 10: Nutritional Hierarchy of Importance (NHI), a guide for prioritizing nutritional adjustments (year round) in the context of bodybuilding.

Off-Season Dietary Adjustments: Macronutrients, Calories, Food Quantity and Variety

Before you can fine-tune how and when to increase caloric intake, you must determine how you'll be adjusting food (upwardly) to support gains in muscle mass. In practice, macronutrient and thus **caloric adjustments** are typically carried out using one of **three methods**:

- **STRICT COUNTING:** **Strictly counting** each caloric macronutrient: Protein, Fat and Carbohydrate and thus caloric content.
- **MAIN MACRONUTRIENT:** Categorizing foods **according to the main macronutrient** : E.g., nuts according to fat contents, breads according to carbohydrate content, "lean" meats according to protein content, *etc.*
- **Adjusting FOOD AMOUNTS and Changing Foods:** **Given years of experience** (typically including substantial of time spent studying nutrition data labels and counting calories and macronutrient amounts), one can become **quite adept at titrating dietary content** to change body composition simply by adjusting the amounts (weight/mass/volume) and even types of foods eaten “on the fly.” (Indeed, the finished product in bodybuilding is a physique, not a precise mathematical calculation derived from nutrient quantities: The macros are just tools of dietary manipulation.) For those of you who use **meal prep companies**, you can often **titrate the macronutrient amounts of the meals in a very calculated manner**, in accordance with what your progress Guideposts tell you.

The “Main Macronutrient” method obviously introduces some error in the context of total caloric intake if one is not paying cognizant of the “secondary” nutrients in a given food. For instance, the caloric content of a fatty oil (e.g., olive or macadamia nut oil) is less than an amount of nuts that contains the same number of grams of fat, but has additional calories from protein and carbohydrate.



COUNT EACH MACRO

- CARBS
 - PROTEIN
 - FAT
 - KCAL TOTAL FOR EACH FOOD
- Example: 2 Tbsp
Almond Butter = 16g
Fat, 7g CHO, 7g PRO

COUNT MAJOR MACRO ONLY

- MAJOR MACRO for ONLY
- Example: 2 Tbsp
Almond Butter =
16g Fat

PRO's

- Accuracy
- Matching macro-equivalent foods as substitutes (variety!)
- Spotting extraneous kcal
- *BEST PRE-CONTEST*

PRO's

- Easy Shorthand
- Flexible for Exchanging Foods
- *BEST OFF-SEASON*

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CON's

- Complexity
- Lends itself to nit-picky eating

CON's

- Inaccuracy
- Hidden Macros / Kcal
- Arbitrary Categories

The savvy coach (that's you, in this case) can also use these "uncounted" macros to increase dietary energy (and macronutrient) intake by changing food choices as the Off-Season proceeds, perhaps less daunting than an overall increase in a macronutrient count and an easy way to increase dietary variety. Conversely, while dieting down, these trace or less significant sources of calories may not be consequential at the beginning of the diet, when fat loss comes more easily, paying closer attention to "uncounted macros" may be necessary closing in on stage-ready body fat levels. (Of course, when

coaching others, and giving free range to eat any of several foods in a particular macronutrient category, it's **not unlikely that a client would choose the foods that tend to be higher in calories**, consciously or not, during a Pre-Contest diet. Calling upon the above example, consuming 20 grams of fat from nuts simply makes for a better tasting, organoleptically enjoyable experience than gulping down the same number of grams of fat as an oil/oil supplement.)

With enough time “perfecting” nutrient tracking (using a Main Macronutrient or counting them all), you (the coach) can quickly learn how to simply adjust food amounts (and change foods) as needed to foster growth (Off-Season) or fat loss (Pre-Contest), thus dispensing with the need to calculate macronutrients and caloric equivalents. Still, **be aware** many of us are poor at assessing our own dietary intake(661, 662), and this may be even more so when consuming a difficult-to-swallow Off-Season or less-than-satisfying Pre-Contest diet.

When weighing foods, note that **the manner in which the food is prepared** can alter the macronutrient amounts per unit weight. As a prime example, **cooking meat** reduces water, fat and vitamin content (shifting macronutrient counts), and the combined preparation strategy of cooking meat after trimming it of visible fat can reduce fatty acid content by >50%(663). Additionally, it's worth noting that the digestion and assimilation of **egg white** are reduced by nearly 60% if consumed **raw**(664, 665). (Some people who “overdo it” drinking pasteurized, but not cooked/denatured egg whites learn this indirect via gastrointestinal distress.)

Thus, **as the diet progresses**, to eliminate unwanted sources of variation in macronutrient intake, one can take the following steps:

- During the Off-Season, if tracking foods using only a Main Macronutrient, be wary of food choices (especially those containing abundant “secondary” macronutrients) and make use of this as a way to gradually increase dietary caloric intake and variety (even without increasing “macro count”).
- [Pre-Contest, when dieting down it may be prudent to begin limiting the diet to only **specific foods** that are very equivalent in caloric intake **and/or** switch to literally **strictly counting each macronutrient.**]
- Be **consistent** with preparation and weighing methods for foods, as well as using the same brand/source of foods, to account for potential variability in accuracy of nutrition data labeling(666-668).

Off-Season Dietary Strategies (Guiding Principles using Biofeedback)

As you've heard me repeat again and again (perhaps *ad nauseam*), we are each unique. **There are just as many distinct strategies to optimally guide an Off-Season diet geared towards gaining muscle mass as there are bodybuilders.** Indeed, what worked for one bodybuilder when younger (and smaller), may not be effective when older and carrying more muscle mass: The optimal Off-Season dietary strategy is anything but static. (This goes for training strategies, supplementation, recovery needs, etc., as well.) For some, guiding principles below may not overlap with what he/she may find optimal. As an example dear to my heart, an older competitor with "plenty" of muscle mass might decide to stay very lean during the Off-Season by limiting carbohydrate calories (using a tailored cyclical low carbohydrate diet) so that he stays as healthy as possible and in shape for photoshoots/appearances, while avoiding both an overly difficult Pre-Contest period and (over)stretching his skin (which seems to be losing elasticity with age).

CONSIDERATIONS

when

Applying Off-Season Dietary Strategies

Dietary Starting Point?

Is an Off-Season Dietary Approach
Appropriate?

Are You Lean?

Is there Room to Gain Bodyfat?

Gastrointestinal BioFeedback

Is your GI ready for Off-Season Eating?

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Do What's Worked!

Don't Throw out the Baby with the
Bathwater, if you've got a different
approach that's works!

Still, there are general **Guiding Principles (Strategies)**, I have found effective over the years for adjusting one's diet to gain muscle mass while minimizing fat gain during the Off-Season. The below principles presume of course a sound diet is in place, containing adequate in protein (~1g/lb/day) and essential fatty acids among the other "Essentials" (covered in [Section 3.4](#)).

These **guiding principles** are just that, however. They are not hard and fast, mandatory, black and white rules, from which one may never stray. **How you employ these guidelines will depend upon:**

- Your **dietary starting point**, i.e., your **diet** as it stands at the time of **beginning the Off-Season**. This could be

a diet in transition from the Pre-Contest diet, or even a diet that, because of a prolonged (planned or unplanned) break from the gym, is a newly initiated diet based on your best guess from past caloric intake.

- Your starting body fat: This section also **presumes that you, the bodybuilder have remained reasonably lean** over the course of the post-contest period and thus can afford to add some body fat during the Off-Season. If not, you may need to simply diet back down into a more advantageous (leaner, insulin-sensitive) position for a prolonged Off-Season dedicated to gaining muscle mass
- **VERY IMPORTANT: Biofeedback** that one's body is providing regarding satiation (fullness after meals) and **satiety** between meals or **hunger** for following meals, as well as how body composition is changing. As a practical example with regards to nutrient timing (see below, [especially Section 3.8](#)) one would not continue to add food to the post-workout meal when/if this were becoming diabolically difficult and/or causing gastrointestinal distress (e.g., diarrhea, gastroesophageal reflux, nausea, etc.). Instead, it makes sense to look to other meals for which one is hungrier. Similarly, an overly aggressive nutrient timing approach characterized by extreme fullness on (high calorie) training days and extraordinary hunger on (low calorie) non-training days may be overly stressful and does not make sense, especially if it's not working, i.e., one is increasing **body fat** without notable increases in **muscle size or strength**. (Common sense suggests merely distributing one's food more evenly over training and non-training days.)
- **Depending on the individual (including his/her past experiences)**, these Guiding Principles might be replaced in part or whole by **that which simply works best**. That's right I said it – the purpose here is to do what works best (even if that means doing something utterly contradictory to the notions put forth here.)

The **Strategies** in place below are listed **loose** priority of application for adding muscle mass during the Off-Season (within each category: **PRIMARY**, **SECONDARY** and **GENERAL**). This means that generally, one would utilize the **PRIMARY strategies** as much as

possible, until lack of appetite and/or progress suggests that the **SECONDARY** (cardio and “mini-diets”) **strategies** might be employed to renew progress. **GENERAL Strategies** could be used in any of a number of situations, alone or in combination with other Strategies.

You would apply these strategies to **ensure weight gain** and **optimize gains in muscle vs. body fat**, of course, in keeping with your Goals. The extent and manner to which you apply these strategies is a bit of an art form as you progress, titrating food into your diet at a rate that puts you on a **trajectory to meet your Off-Season's goals for gaining muscle**, but doesn't add **so much body fat** that you prematurely reach your personal body fat maximum and/or are left with an overly lengthy Pre-Contest diet. (For more on these concepts see [Goal of Moving up a Weight Class In Section 1.3](#) and the [Chapter 6 FAQ](#) on “How much weight to gain in the Off-Season?”).

REMINDER: Don't forget that the Strategies below are general principles and **each individual's situation is unique**.

- **PRIMARY STRATEGY:** Employ Nutrient timing by Increasing **PeriWorkout Nutrition** ([see Section 3.8](#)), specifically by adding to the PeriWorkout Recovery Supplement and/or to the 2-3 meals during the 6-8hr **post-workout period, one meal at a time**. One would titrate these meals upward adding to one or other as one becomes accustomed to the food intake and/or weight starts to plateau. **Eventually, after all of these meals are very large and filling**, this could be the period when one would need to consume **calorically dense food**, or what could some might call a “**Cheat Meal**” (or Treat Meal) that is literally an “all you can eat” meal (For more on cheat meals [Section 4.5](#)) However, the “all you can eat” meal should also be monitored/standardized as a known meal (i.e., eat the same foods or one of 2-3 meal options) so you're eating the same thing each time (and not under-eating as time goes on, thus offsetting calories added elsewhere to the diet).
- **PRIMARY STRATEGY:** After you have “maxed out” (for the time being) Food Intake Peri-and Post-Workout, **Add Food to OTHER Meals, One Meal at a Time, According to Your Appetite, Satiety and Strategy**. For instance, if you're eating a low carb approach outside of the PeriWorkout period, increase low carb food sources containing [healthy fats](#) starting with the meal(s) that you are least hungry for and/or are the least filling (i.e., on Nontraining days and/or Training days

before the workouts and **after** the first 2-3 meals post-workout). If you're following a higher carb diet, this would mean increasing carbohydrate sources during those meals that are the least filling/for which you are most hungry. **The meal to which you add food could vary each week given this approach, so be careful to pay attention to which (non-Peri/Post-Workout) meal feels like it would be the easiest to enlarge.**

- **PRIMARY STRATEGY:** If possible, entrain a “feeding” **circadian rhythm**(669-672) by focusing on increasing **meal size** on **NON**-training days according to the **nutrient timing pattern** you follow on training days. In my experience, this enhances appetite and food assimilation during both the post-workout period, as well as on days one doesn't train. For instance, if one typically trains in the late afternoon, is eating as much as reasonably possible peri-and post-workout, and, on non-training days, appetite is constant across meals, this Strategy could be applied by adding food to the last 2-3 meals on **non-training day**, i.e., those meals correspond temporally with high nutrient intake during the training day peri-/post-workout period.
- **2° STRATEGY:** Include some form of “toggling” between periods of higher and lower caloric (and possibly carbohydrate) intake. If you are not already, this could mean **matching** caloric (and carbohydrate) intake **to daily energy expenditure** (in particular training vs. non-training days). Another basic approach is to **reduce caloric intake** during periods of training deloading (aka “cruising”) and/or have formal **mini-cuts** (lasting 2-3 weeks) every few months where the goal is specifically to diet for fat loss. These approaches will have the effect of restoring/maintaining insulin sensitivity (see [Section 3.7](#)), ensuring hunger on days when caloric intake will be higher, providing a psychological break from the Off-Season grind, and generally pressing the “restart” button.
In the context of mini-cuts lasting several weeks, it's likely that **faster weight loss risks greater muscle (fat-free mass) loss**(673) and the risk for muscle loss is **greater when one is leaner** (or the caloric deficit is relatively greater)(674, 675). Even steroid use does not afford 100% protection against losing size if you diet too hard(676), but relatively large caloric deficits

(>700kcal/day) can be applied **over the short term** (a few weeks) with minimal risk of losing muscle or strength(675) or eliciting compensatory metabolic adaptations(677). [NOTE: The **converse of this** – taking time off the diet to eat more food - can be employed when **dieting down (Pre-Contest)**, e.g., alternating between dieting in a caloric deficiency for 3 weeks and eating at maintenance for a week. See [Section 4.1.](#)]

- **2° STRATEGY:** Especially for those who favor low training volume (typically high training frequency) training regimes and/or are relatively inactive outside of the gym, **consider including Off-Season cardio** using the form of cardio least likely to interfere with muscular gains. (See the Special Section on [Cardio in the Off-Season.](#)) Preferably, ensuring ways to be more active generally (called NonExercise Activity Thermogenesis or NEAT) such as stand-up desks, hobbies, housework, *etc.* can help in preventing body fat gain(678). I personally like to pick hobby projects that keep me busy (especially when trying to ensure NEAT Pre-Contest.)
- **GENERAL STRATEGY:** Allow protein intake to increase simply through the incorporation of whole foods. **If body fat is increasing rapidly**, consider **increasing protein intentionally** (if **protein intake levels are not already exceedingly high** and appetite will permit it) to foster weight gain. As noted above, ([Section 3.2 – Protein: When and What?](#)), increasing protein *per se* is highly unlikely to increase body fat and doing so may actually foster fat loss: In terms of risk of adding body fat, adding protein is probably the safest macronutrient to add to foster muscle growth Off-Season. However, it may be much easier (and effective) to increase carbohydrate and/or fat to foster this purpose.
- **GENERAL STRATEGY:** Build up your food intake during the Off-Season in general. As long as you're not sacrificing your health in doing so (e.g., without causing gastrointestinal issues, hypertension, gaining excessive body fat, *etc.*) or merely getting fat in the process, the more food you can build up to eating in the Off-Season, the better. Greater food consumption at the end of the Off-Season (**all other things being equal**), means a more substantial margin of calories to draw from to

evoke a caloric deficit (to promote fat loss) Pre-Contest. Of course, eating more food when dieting Pre-Contest would theoretically translate into better retention of muscle mass(679). This may be especially true when it applies to end of Off-Season carbohydrate intake. Although it would be impossible to infer cause and effect from these data, a recent study of British bodybuilders suggests that those who were eating the most carbohydrate (relative to body mass) at the start of their Pre-Contest diets did indeed place better on show day(679).

As a **general caveat**, those of you who are very large and require very high caloric intake to foster growth may very well find that patterns of meal macronutrient content, nutrient timing and other and meal-to-meal variations are minimal at the end of the Off-Season: By then, you might simply be eating as much as possible over the course of the day. Hopefully, though, by getting the most from the least and taking small steps to promote muscle growth, the agony of constantly pushing the food envelope by "overfeeding" every single meal can be largely avoided in the Off-Season by employing the "smart" dietary manipulation Strategies I've proposed above.



Figure 11: Overview of 1° and 2° Off-Season Dietary Strategies.

Example of Off-Season Dietary Adjustments

Because many of you reading this may have read my previous book, Fortitude Training® (<http://www.fortitudetraining.net>), for the sake of familiarity, simplicity and consistency, I'll employ a dietary example used in that publication. To be sure you're up to speed with the strategies employed in that example, Please note the following:

- The below diet uses a **nutrient timing approach** (a **Primary Strategy** above) both by incorporating a peri-workout (peri-WO) recovery supplement ([Section 3.8](#)) as well as limiting carbohydrate on non-training days in an effort to retain insulin sensitivity ([Section 3.7](#)). I've had great success with this kind of nutrient timing approach, by making it rule of thumb that there be a substantial difference in hunger and satiety on non-training days versus training days (especially post-workout). In fact, as long as progress is forthcoming - one doesn't feel deprived or weak and unable to train properly from lack food on non-training days and before training, being somewhat hungry on these days is acceptable. (Recovery should still occurring on these days, but the priming the appetite for large nutrient intake peri-workout .) **Again, I'm not concerned if a bodybuilder is slightly hungry on non-training days as long as weight and strength are increasing week by week.**
- Simply dividing the week's diet in to **Training Day** vs. **Non-Training Day** diets suits itself well to Fortitude Training® (and as an example diet for the purposes of this book) because the load, volume, stress and energy expenditure of the training days (typically 4 days/week) of FT are roughly equivalent. Moreover, it makes sense to consume more food on the two training successive training days to promote recovery, given there is not a rest day in between). This is an example of a **2° Strategy** mentioned above.
- For a training system where there are heavy (e.g., leg and back training), light (e.g., arms, calves, and abdominal training) and non-training days, this strategy could be adapted by setting out three different daily diets that to **match energy expenditure** on those days.
- Additionally, to focus **recovery on the days one trains weak muscle groups**, greater food can be consumed.
- With respect to the above two points, note that adjusting caloric intake relative to **training load** (and lack thereof) and any need to **prioritize recovery** of weak muscle groups, one can also **meter the overall rate of body fat gain**, by consuming less (but adequate) food on non-training days and days when

training muscle (groups) that already grow well. For instance, someone with great leg development might eat enough to support recovery from leg training, but shift overall weekly caloric intake before and after training weaker muscle groups. (See [Section 1.3 Goal #2](#) on bringing up weak muscle groups for more on this topic.)

- Related to the above, also note that **TIME OF DAY** can make a difference as to how one constructs a daily diet: Because some individuals can and do train harder if they've eaten well that day or the day before, meals previous to training may be important.
- Ideally, during the Off-Season at least, **carbohydrate is in great enough supply** between workouts for a given muscle to **restore glycogen** and ensure workout **performance**(680, 681) (and resultant growth stimulus). This, of course, could need adjusting on an individual basis (based on diet and training volume). Many of you who have trained hard on a low carb (Pre-Contest) diet know how this can negatively gym performance and your ability to get a pump. If you are experiencing this and/or it is reversed by adding dietary carbohydrate to the diet (e.g., a high carb re-feed meal), these are sure signs your habitual diet might be relatively carbohydrate deficient (for the purposes of bodybuilding).
- The assessment for each week would include, but not be limited to the items listed in [Chapter 1.2 Weekly Progress Markers](#). These include current and previous week's bodyweight, skinfolds, pictures, current diet and assessment of which meals were the least and most filling, and for which meals you were the least and most hungry.

<u>START OF OFF-SEASON: TRAINING DAY EXAMPLE DIET</u>			
Meal Times & Examples	Pro g	Carb g	Fat g
7AM <i>Example Meal:</i>	40	0	70
11AM <i>Example Meal:</i>	40	0	70
2PM <i>Example Meal:</i>	50	15	30
Peri-WO: 4:30-6:30PM <i>Shake:</i>	50	170	0
Post: 7PM <i>Example Meal:</i>	50	200	0
Post: 9:30PM <i>Example Meal:</i>	50	200	0
Approx. Actual Totals	280	585	170

<u>NON-Training Day EXAMPLE DIET - LOW CARB (Less Aggressive Approach)</u>			
Meal Times & Examples	Pro (g)	Carb (g)	Fat (g)
7AM <i>Example Meal:</i>	40	15	70
11AM <i>Example Meal:</i>	60	0	45
2PM <i>Example Meal:</i>	40	20	30
4:30 PM <i>Example Meal:</i>	50	10	35
7PM <i>Example Meal:</i>	40	2	70
9:30PM <i>Example Meal:</i>	50	15	30
Approx. Actual Totals	280	62	280

Table 12: Start of Off-Season Example Diet (Training & Non-Training Days)

The below table summarizes weekly adjustments for an idealized/imaginary client to provide you a simple example. Per the above bulleted notes, you can see in the Table see that food is added using a **nutrient timing** approach by adding to the peri-workout period (intra-workout drink and post-workout meals) according to

appetite/fullness during these meals. When these meals can no longer be increased, food is then added on **non-training days** late in the day per a **circadian rhythm** approach and, as is typically the case, hunger is also greater at this time of the day, all other things being equal. (This also ensures nighttime nutrient delivery). Other strategies are also noted. The de-load (or "Cruise") periods are times for vacations and life outside of bodybuilding.

[Abbreviations used: Wk=Week; BW= Body Weight; Skfd Tot. (mm) = Total of three self-selected skinfold sites. Perc. Recov. Status = PRS Scale Rating (See [Chapter 2 Special Section on Overtraining](#)).]

Table 13: Off-Season Dietary Adjustments Example.

Wk	BW	Skfd Tot. (mm)	Pics	Diet / Hunger	Strength	PRS (0-10)	Adjustments
0	220.0lb	20.0	Initial	Initial	Initial	9	N/A
1	221.5lb	20.0	√	No Δ	Increasing	9	None
2	221.1lb	22.0	√	No Δ	Increasing	9	None
3	221.4lb	22.0	√	Add food	Increasing	8	Hunger increased, esp. post-workout. The Post-9:30PM meal lends itself to more food: Add ½ chx breast bagel sandwich (3oz chicken breast, ½ bagel + ¼ cup onion w/ garlic sauce).
4	222.2lb	23.0	Showing size	Add food	Still increasing	7	Hunger still increasing & Post-Workout meal is easy eaten: + 1 cup of rice crispies cereal to post training meal
5	223.0lb	23.6	Water logged	Hunger is stable	Increasing	7	+ another cup cereal to Post 7PM meal, Training days. (NON-Training Day diet food are changed (equiv macros))
6	223.8lb	24.0	Water is gone	Hunger is stable	Plateauing	6	+ another cup of cereal to post-WO meal (7PM)
7	224.5lb	25.0	Posing is poor	Hunger waning	Time To Deload	4	Goal is recovery during deload: Same diet, but training once less → more non-training day diets.
8	224.0lb	24.0	Posing improved	Hunger returning	Deload continues	6	Diet as before: Training 3 days/week
9	224.0lb	23.0	Physique looks harder	Hunger good	Ready to go!	9	No Macronutrient Δ's, but non-Training day Diet is rotated again; back to progressive training.

Wk	BW	Skfd Tot. (mm)	Pics	Diet / Hunger	Strength	PRS (0-10)	Adjustments
10	225.0lb	23.5	As Above	As above	As above	9	Add another half bagel sandwich in the last meal of the day (per week 3).
11	226.0lb	25.0	√	Hunger is stable	Strength progressing	9	Intra-Workout is much easier to get down now: Add 20g protein, 50 grams carbs
12	226.9lb	25.5	Looks Full!	Hunger OK	Strength doing well	8	Ride the wave of growth: No changes needed, but Training Day PRE-workout meals are changed (same macros).
13	227.4lb	25.9	Full!	Hunger better	Strength still rising	8	More can be added to intra: Use Hydrolyzed protein (10g) with 30g highly branched cyclic dextrin.
14	228.2lb	26.2	Fuller	Hunger OK	Strength doing well	7	Post-WO period is nearly maxed out: Change to Muesli with kid's cereal post-workout to add 25g carbs
15	228.9lb	26.8	Dried out a bit	Hunger waning	Strength still OK	5	Adds 1/4 Loaf Manna bread to Last Post-WO meal of day
16	229.6lb	27.2	Watery	Rarely hungry	Time for Deload	3	Start Deload at this time as week 7

[Abbreviations used: Wk = Week; BW = Body Weight; Skfd Tot. (mm) = Total of three self-selected skinfold sites. Perc. Recov. Status = PRS Scale Rating]

Wk	BW	Skfd Tot. (mm)	Pics	Diet / Hunger	Strength	PRS (0-10)	Adjustments
17	228.8lb	26.8	Still watery	Hunger OK	Deload continues	6	Cruise Diet as previously (week 8); A vacation and home projects happen this week.
18	226.0lb	26.3	Water dropped	Hunger returned!	Ready to go!	8	Return to Training/Diet as before starting Deload
19	229.1lb	26.8	Filling out	Hunger OK	Some Strength lost with deload	8	Weight gain and diet suggest sticking with current diet.
20	229.8lb	26.9	Full	Hunger OK	Strength Returning	9	Adds in twice/week AYCE sushi buffet post-workout. This add ~1000kcal/week approximately
21	231.0lb	27.5	Full as a house	Hunger OK (buffet helps)	Strength skyrocketin	9	Sushi gains are working! No need to change anything.
22	231.6lb	28.0	Full	Fullness tolerable	Strength progressing	10	Sushi still working at this point (Get the most from the least!) Change Non-training day food sources again.
23	232.1lb	28.3	Full	Hunger only on Non-training days	As Above	9	Training Day food maxed. Last 2 meals of Non-Training day are easiest (circadian effects): Add 3 eggs to the 7PM meal.

[Abbreviations used: Wk = Week; BW = Body Weight; Skfd Tot. (mm) = Total of three self-selected skinfold sites. Perc. Recov. Status = PRS Scale Rating]

Wk	BW	Skfd Tot. (mm)	Pics	Diet / Hunger	Strength	PRS (0-10)	Adjustments
24	232.0lb	28.5mm	Dried out a bit	As above	Strength Progressing	7	Add .5 scoop whey isolate to protein drink
25	232.5lb	28.2	Even drier	As above	Strength excellent	7	11AM meal is easiest: Add 1 low fat chicken sausages
26	233.0lb	28.4	Full	Hunger improving	Strength plateauing	5	Start Deload as done previously
27	232.0lb	28.0	Sharper	Hunger stable	Deload continues	4	Cruise Diet as Previously, but new foods during the last training days meal (same macro counts).
28	231.5lb	27.5	Even sharper	Hungry on Training Days again	Still needs more deloading	5	During this deload: Vacation with a good amount of walking but "off-diet food" to retain body weight.
29	231.2lb	27.0	Very happy	Hunger returned	Time to Blast	8	Return to Previous Blast's diet but with new foods as adjusted during Deload/Cruise
30	233.2lb	27.7	Fuller	Hunger OK	Feeling Strong (changed several exercises)	8	Stick with current diet as it's working well.
31	234.0lb	28.2	Very Full	Tolerable	Feeling very strong	9	Add a third day of AYCE sushi buffet post-training
32	234.5lb	28.3	"	Better	Strength progressing	9	Ride this out one more week: No Dietary Changes

[Abbreviations used: Wk = Week; BW = Body Weight; Skfd Tot. (mm) = Total of three self-selected skinfold sites. Perc. Recov. Status = PRS Scale Rating]

Wk	BW	Skfd Tot. (mm)	Pics	Diet / Hunger	Strength	PRS (0-10)	Adjustments
33	234.8lb	28.2	Full	Better	Strength doing well	8	Begin Dietary Holding Pattern before starting Pre-Contest period: No changes for up to 4+ (if possible) weeks to establish baseline.
Δ 's	14.8lb	8.2	Pics show substantial size gains with min. body fat (+8mm is small)				

[Abbreviations used: Wk = Week; BW = Body Weight; Skfd Tot. (mm) = Total of three self-selected skinfold sites. Perc. Recov. Status = PRS Scale Rating]

In the above example, this was a very modest gain in body weight (~15lb), as could very often be the case during the true Off-Season, i.e., the months **after** the post-contest period, during which perhaps the equivalent amount of body mass (and body fat) might have been gained. However, this slow and steady approach during the long Off-Season also resulted in only a gain of 8mm total on skinfolds. **Other patterns of change are also possible of course**, and typically, just like every Pre-Contest prep is different, every Off-Season will be different for different bodybuilders, year by year. Another successful example (during the Summer/Fall 2017) where tremendous weight gain did not occur, a similarly sized client of mine (using Fortitude Training®) only gained 8lb (from 236 to 244lb) of body weight but skinfold total **dropped** from 56mm to 34mm over the course of 5 *months* (20 weeks).

3.4 Dietary Essentials: Micronutrients, Fiber, Probiotics, *Etc.*

"ESSENTIALS" (Mostly Unchanging) MicroNutrients, Fiber, ProBiotics, Etc.

As this section denotes, I consider certain “essential” components of a bodybuilder’s diet to be unwavering staples regardless of the yearly Training Period and thus rooted at the bottom of the Nutritional Hierarchy of Importance. As you probably suspect, these would include adequate **micronutrient** intake (vitamins and minerals, including macrominerals, trace and ultratrace minerals, which the body cannot manufacture), as well as **fiber** (non-digestible carbohydrate), **probiotics** (healthy gut bacteria), and many **other dietary/nutritional supplements** that some of you might personally feel are essential for your health (and progress) when pursuing high-level bodybuilding. Of course, full coverage of each of these dietary components is **far beyond what the scope of what I’ve intended for this book**, but because of their importance and ubiquity in the health and fitness marketplace, I’d like to very briefly touch on each category below, to at least help you become a more savvy consumer (see the Summary Table of the micronutrients below).

Table 14: Overview Summary of Vitamins, Minerals, Trace and Ultratrace Minerals. [Information compiled from various sources(358, 682-687).]

VITAMINS	Function	Sources
Vitamin A (Fat Soluble)	Vision, bone growth, reproduction, antioxidant actions and immune system health.	Fruits, veggies, liver and whole milk and fortified foods like cereals.
B Vitamins (Thiamine, Riboflavin, Niacin, Pantothenic acid, Biotin, B-6, B-12 & Folate)	Manifold roles in metabolism, particularly as (constituents of) co-enzymes and red blood cell formation (folate).	Fish, poultry, meat, eggs, and dairy products; leafy green vegetables, beans, and peas, and fortified cereals and breads.
Vitamin C	Vitamin C is an antioxidant, vital for collagen formation, assists in iron absorption	Fruits and vegetables: Citrus, red and green peppers, tomatoes, broccoli, and greens, fortified juices and cereals.
Vitamin D (Fat Soluble)	Calcium absorption and multiple roles in the nerve, muscle, and cellular immunity.	UV exposure to the skin, diet, and supplements. Egg yolks, saltwater fish, and liver, fortified milk and cereal.
Vitamin E (Fat Soluble)	An antioxidant with a role the immune system and metabolic processes.	Vegetable oils, margarine, nuts and seeds, leafy greens and fortified foods.
Vitamin K (Fat Soluble)	Protein synthesis for healthy bones, soft tissue and blood clotting	Plants such as green vegetables, and dark berries (K ₁). Bacteria in your intestines also produce small amounts of K ₂ .

MACRO-MINERALS	Function	Sources
Calcium	Component of bone and teeth mineral, cardiac, skeletal and smooth muscle contraction, erythropoiesis, part of various protein complexes and an enzyme co-factor.	Dairy products such as milk, cheese, and yogurt, leafy, green vegetables, fish with soft bones (canned sardines and salmon), calcium-enriched foods such as bkfst cereals, fruit juices, soy & rice drinks, & tofu.
Phosphorus	Components of teeth and bone, as well as DNA, RNA, ATP, etc; Phosphorylation is important for allosteric control of enzyme activity, component of cell membranes as phospholipids.	Found in meats and dairy products as well as processed foods (such as soft drinks).
Magnesium	Bone mineralization, protein synthesis, enzyme action and normal muscle contraction and nerve conduction	Nuts, legumes, whole grains, dark leafy greens, veggies, seafood, cocoa.
Sodium	Glucose transport, nerve and muscle cell function, and body fluid homeostasis.	Typically from restaurant and fast, food, breads, meats, poultry and eggs and various sauces.
Potassium	Intracellular electrolyte that also helps with fluid balance (intra- vs. extracellular) and heart contractility.	Leafy greens (e.g., spinach, collards), fruit from vines (e.g., grapes, blackberries), root vegetables (e.g., carrots, potatoes), and citrus fruits (oranges, grapefruit).
Chloride	Important for fluid and electrolyte balance; Component of HCl used in digestion.	Salted and processed foods, sauces, whole, unprocessed foods.
Sulfur	Component of proteins, enzymes and hormones, and involved in detoxification (sulphation) reactions.	Found in essentially all protein-containing foods.
Cobalt	Component of Vitamin B12: DNA, fatty acid, amino acid metabolism.	Meat, milk, eggs and fish.

TRACE MINERALS	Function	Sources
Iron	Iron is part of hemoglobin and myoglobin, oxygen transport molecules, as well as many other proteins and enzymes.	Excess iron can impair Zn absorption. Found in oysters, spinach, meats, fish, poultry, shellfish, eggs, legumes, dry fruit.
Zinc	Co-factor for and component of (metallo)enzymes involved in macronutrient metab., DNA & RNA synthesis, free radical quenching, wound healing, spermatogenesis, fetal development.	Excessive zinc intake can impair copper and iron absorption. Found in protein-containing food: Oysters, meats, fish, poultry, grains, veggies.
Manganese	Co-factor for many enzymes	Manganese is found in most plants, but iron & calcium can inhibit its absorption
Copper	Helps with iron absorption and is a component of several enzymes, including those of wound healing and free radical scavenging.	Found in meat and organ meats (liver, kidney).
Iodine	A component of the thyroid hormones: Metabolic regulation	Iodized salt, seafood, bread, dairy, plants & animals where soil is iodine rich.
Fluoride	Component of mineral salts of bone and teeth,	Many fruits and vegetables, eggs & milk, water & drinks.
Selenium	Component of Glutathione peroxidase and involved in T ₄ to T ₃ conversion.	Seafood, meats, grains.
Chromium	Insulin co-factor, essential to normal macronutrient metabolism.	Meat, unrefined foods, vegetable oils, fats.
Molybdenum	Component of metalloprotein enzymatic complexes.	Needed in very small amounts. Found in legumes, cereals and organ meats.
Ultratrace Minerals	Some Examples: Nickel, silicon, tin, vanadium, boron, lithium, strontium, boron and perhaps even arsenic and many others.	Functions: Various roles in growth, development and unknown roles

Multi-Vitamin/Mineral and Antioxidant Supplementation

I have written a large section in my book **Fortitude Training®** about vitamin supplementation, where I note, for example, that in the case of antioxidants, supplementation does not generally seem to extend life or protect against sickness(688), whereas **greater intake of fruits and vegetables** may have this benefit(689). Overall,

however, multi-vitamin multi-mineral intake, in the general population is an effective guard against inadequate intake of the micronutrients, the major vitamins and nutritionally-essential minerals (690). There is some concern that heavy training can increase the need for the B-vitamins, but it seems food can easily meet these needs (unless perhaps you're eating very little during Pre-Contest dieting) and a simple multi-vitamin can also do the trick (691). [There is only very scant evidence that vitamins have ergogenic actions in otherwise healthy (non-nutrient-deficient) individuals(682).] Minerals can be depleted during prolonged exercise in the heat due to sweating(692), including sodium, potassium, chloride, calcium and magnesium(648). Especially if your workouts are over an hour, replenishing both fluid and electrolytes (and carbohydrate), ideally such that you at least maintain body weight over the course of a workout(648), is a nutrient timing principle covered by using a **peri-workout recovery drink** (see Section 3.8)(659). Additionally, women are at risk for menstruation-related iron losses, and should consult with a medical professional if anemia presents itself(690). In lieu of a **deficiency** and/or the overt resulting **health consequences**, it doesn't seem that mineral supplementation has an ergogenic effect(692).



When it comes to (vitamin) antioxidant supplementation, some free-radical stress seems essential for fine tuning our biology(693) and megadosing with antioxidants like Vitamin C (e.g., 1000mg/day) and E (e.g., 400IU/day) can even blunt exercise training adaptations(694). In fact, in high doses, supplements considered antioxidants, such as alpha-lipoic acid (695), Vitamin C and N-acetylcysteine(696) can have **prooxidant** effects. In an adaptive process called hormesis, the free radical stress of exercise promotes adaptation up to a point, but when in excess is maladaptive. (The dose-response curve is bell-shaped.) So, **both the dose and timing of antioxidants** (relative to the adaptive processes brought on by a given workout exercise) matter as to whethersaid supplement would help or hinder progress(697). (For

more on this topic, see the [Section 3.6 on Supplement Stacking, Timing and Hormesis](#).) On the other hand, the health benefits from fruits and vegetables, nutrient dense([698](#)) sources of the vitamins and minerals that many bodybuilders may actually be lacking([699](#)), may also come from the **synergistic nature of a multiple of bioactive ingredients**([340](#), [700](#)). Food spices and additives like garlic and cinnamon may exert their healthful effects through similar mechanisms by prompting our body's own cells to appropriately step-up their own detoxifying and free-radical quenching abilities([701-708](#)). Thus, if you intend to use a broad-based supplement to cover your micronutrient (vitamin and mineral) bases, there is some logic to choosing a **food-based multi-vitamin/mineral** [where components are derived from real food sources rich in bioactive (phyto)nutrients that typically have no governmentally sanctioned recommended level of intake]. If you choose to favor a whole food approach to obtaining micronutrients, spices can help with both taste and the healthiness of your dishes (see [Section 3.6](#) below on food preparation).

Fiber Intake and Supplementation

Dietary fiber has been generally defined as carbohydrate that is non-digestible by the **human** gastrointestinal (GI) tract, categorized as (water-) soluble and fermentable, such as fruit pectin or insoluble, or as having more of a colonic bulking action, such as wheat bran. Within the term "fiber," oligosaccharides are included, such as inulin, which are prebiotic in nature (feeding the healthy, helpful probiotic bacteria that live in our gut) ([709](#)). (For more in the microbiome of bacteria living in our GI tract, see below and my book [Fortitude Training®](#).)

Because of this intimate relationship with the microbiome, fiber is vital for good health, and thus a year-round dietary essential year round. (If you have ever tried a highly restrictive diet lacking in fiber, you probably know first hand the adverse effects doing so can have on your gastrointestinal system.) A higher fiber intake [daily recommendations run ~14g/1000kcal consumed ([709](#))] is associated with longer life expectancy([710](#)), and a reduced risk of dying from most of the of the big killers in modern Western society, such as heart disease, diabetes and other obesity-related disease([709](#)). Even 10g increments in daily fiber intake (primarily insoluble), from the low (~15g/day) toward high (~27g/day) fiber end, are associated with significant health benefits([710](#)).

For bodybuilding purposes, during the Off-Season, fiber may be helpful in increasing regularity([711](#)). Note also that fiber and fiber

supplementation may have a modest appetite-curbing effect(712) and thus be helpful Pre-Contest by when fat loss is the goal [e.g., as seen clinically with obese subjects supplemented with glucomannan(713)], but not especially helpful in those who don't have a hearty appetite.

Do I Need a Fiber Supplement?

First and foremost, adequate fiber, via food (e.g., oatmeal, fruit) or, if needed, via supplements (psyllium husk, e.g., as Metamucil or methylcellulose as found in Citrucel), should be a mainstay of your diet during the entire year. Using the guideline noted above, this might mean 70g fiber/day in someone taking in 5000kcal diet, but of course, this caloric burden may be far above what your GI is "designed" to handle. A minimum of 20-30g/day seems a fine rule of thumb, given the data on health risks, and beyond this, one can use fiber supplementation as a tool in fine-tuning gastrointestinal health.

In my experience, both too little and too much fiber can cause GI issues at either end of the diarrhea-constipation spectrum. Choosing the particular form of fiber (soluble or insoluble) with which to supplement **may also require some experimentation**, in the context of the form and amounts already found in your diet otherwise.

In my experience with clients, the OTC product **Benefiber®** (a soluble fiber supplement) seems to have a **regulatory effect**, helping to reduce both diarrhea as well as promote bowel movements in those who are constipated. On the other hand, psyllium husk has served me well in the past to control loose stool when consuming large Peri-workout recovery supplements. In other words, your mileage may vary.

DISCLAIMER: Do not hesitate to see **the appropriate medical professional** if you have persistent or extreme **gastrointestinal discomfort**, irregularity or other abnormal symptoms such as bloody or mucous-filled stool.

Pro-and PreBiotics: What, How & Why?

Also covered in my book **Fortitude Training®**, the basics of probiotics are worth reiterating here.

- We live in union with ~100 trillion bacterial microorganisms, our "**microbiome(714)**", found mostly in our GI tract, where these "probiotic" bacteria aid in immune function, nutrient processing and absorption, and warding off pathogens(715) [most notably the lactic acid bacteria – of the *Lactobacillus* and *Bifidobacterium* genera(715-718)]. **Probiotics** have

promise in treating antibiotic-associated gastrointestinal disorders such as diarrhea(719), ulcerative colitis(718, 720), irritable bowel(721, 722) and lactose intolerance(723), as well as colon cancer, diabetes, food allergies(724), respiratory infections(724), cardiovascular disease(725, 726) and even neuropsychiatric disorders(727). [It's also worth noting that gut bacterial viruses (bacteriophages, which are part of the “human virome”) are more numerous than the bacteria of the gut microbiome themselves and hold promise as a means of promoting health and treating disease(728-730).]

The Microbiome!

What?

- **Probiotics:** Healthy Gut Bacteria
- **PreBiotic:** Typical Fiber that is "Food" for probiotic bacteria
- **Synbiotics:** Contains both Pre- & Postbiotic
- **Postbiotic:** Refers to probiotic metabolites (e.g., SCFA's)
- **VEGGIES, FRUITS, Mediterranean-Style Diet**

How Does It Work?

MICROBIOME - GUT - BRAIN AXIS

MULTIPLE PATHWAYS OF BI-DIRECTIONAL COMMUNICATION!!!

- VAGUS
- IMMUNE
- NEUROENDOCRINE
- METABOLITE

Why Have a Healthy Microbiome?

- Gastrointestinal Health
- Stronger Immune System
- Better Insulin Sensitivity
- Lower Body Fat
- Mental Health
- Appetite Control
- Performance Enhancements?...

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These **probiotic** bacteria (“probiotics” when consumed in food or supplement form) utilize non-digestible food components “**prebiotics**”(724, 731, 732) like fibers such as fructooligosaccharides and inulins as nourishment. **Synbiotic**(724, 732) supplements (composed of pre-and probiotics) may often have superior health benefits compared to probiotics alone(718, 720), presumably mediated by the

postbiotic healthful substances produced by **probiotic** bacteria(733).

- **Prebiotic** substrate is found in foods such as include **legumes**, **vegetables** (onion, asparagus, garlic), **cereals** (wheat, barley and rye), **fruits** (banana, tomato) (734), raw honey(735) and chicory due to its high **inulin** content(736, 737). Dietary prebiotic feeds into the microbiota-gut-brain axis, which can influence mental function and appetite(727), e.g., via the bloodborne **short-chain fatty acids** (such as propionate) produced by the microbiome that make their way to the brain(738).
- **Probiotic** foods are typically **fermented**(739, 740) (using bacterial “starter cultures” containing *Lactobacillus* and *Bifidobacterium* in most commercially-available products(739)): Dairy-based products include yogurt (including **Greek yoghurt**), kefir, and aged and cottage cheese(739) [but not frozen yogurt(741)], and fermented foods like **kimchi**(742), **sauerkraut**(743), miso soup(744), **pickled vegetables**(745-747), and **kombucha** tea (748, 749) (perhaps my favorite).
- As you begin to eat more in the Off-Season, you might add in more probiotic foods, whereas a limited Pre-Contest diet could be improved by **supplementing with probiotics** to aid your microbiome, which can actually enhance insulin sensitivity(750). As your diet changes, the bacterial populations in your microbiome will shift as well(182). Slowing moving to pre-, pro-or synbiotic supplements [e.g., 1-2g inulin with probiotic labeled to have a **colony forming unit (CFU) count in the 10 billion range**] is a place to start(751), although the “**perfect**” **synbiotic supplement** to optimize remains a **mystery**, and is likely highly dependent upon the individual, one’s diet(628, 752) and dietary probiotic intake, health status(753) and likely a host of other variables.
- As you might have guessed, in addition to consuming **fermented foods** and **supplementing with syn/probiotics**, diets high in vegetables, fruits, cereals and legumes can promote healthy gut microbiota(752). Individuals who were the **best at adhering** to diets that

were **vegetarian**, **vegan** and, perhaps most important for those of you reading this, **Mediterranean** (high in fruit, vegetables, legumes, nuts, **fish**, but moderate in alcohol with lower levels of saturated fat and other meat intake and strongly) had higher levels of fecal short-chain fatty acids (see above) and the bacteria that make them (752). This is important because of the wealth of information supporting the **Mediterranean** diet's beneficial impact on a wide array of **non-communicable** diseases including cardiovascular disease, obesity, some forms of cancer, metabolic syndrome and Type II diabetes, and even dementia(754). (Note for those who also want to follow a **low FODMAP rule** for reasons of gastrointestinal disease/distress (see [Section 3.2](#)), modifying one's food selection while adhering to a Mediterranean diet might be necessary.)

- Do note that **mislabeled/bunk probiotic products**(755, 756) and even those with harmful bacteria(757) are not unheard of in the supplement marketplace. (With the guidance of a medical professional, a **stool analysis** may help you fine tune your probiotic intake.)
- Direct studies on **exercise performance** are lacking(758), but a healthy microbiome may help support the immune system during stressful periods of training(759, 760). Eating the above-mentioned foods **containing a wide array of probiotics**(739) and including plenty of fruits and vegetables (752) seems the best way to increase your chance of having a balanced, flourishing microbiome.
- The impressive impact of the gut's microbiome on our biology is a fascinating and flourishing area of research, especially if one considers that **the vast majority of our body's cells and genes are those of the symbiotic bacteria in our microbiome**(715). Given this, it's not surprising to learn that the composition of one's gut bacterial population and its metabolism very strongly predicts mental health status(727), basic responses to food (e.g., glycemic index)(182, 715), satiety(738), as well as how we process and store energy(761), which of course determines body fat stores(727, 762).

- The microbiome of professional athletes differs substantially from that of sedentary individuals(763), and exercise training shifts the bacterial population in favor of bacteria that produce short-chain fatty acids(594), reflecting the importance of our microbiome in coordinating health and nutrient handling. Unraveling the puzzle of the gut microbiome will most certainly yield the power to treat a wide range of **medical conditions** by manipulating the composition of the gut microbiome, e.g., with **specific bacteria** [such as *Saccharomyces boulardii* to treat diarrhea(719, 764)] and procedures such as **fecal transplants**(761).

Other (Off-Season) Dietary/Supplemental “Essentials”

There are a plethora of dietary components and nutritional supplements you might consider year-round essentials, specifically if these **seem to suit your needs personally**. Most of these, as with most nutritional supplements would be, per the Nutritional Hierarchy of Importance (Section 3.2), “icing on the cake.” As examples, however, certain **nutraceuticals** and herbs that have healthful antioxidant, anti-cancer, antiaging or other disease countering actions *might be considered essentials* for some of you (on a case by case basis, with the ultimate decision resting with you, the consumer) such as those below, among many others. You might come to these herbs based on your particular cardiovascular risk factors, family disease history, genetic testing, lifestyle factors, and/or your own medical history and disease status. (Covering this topic fully is far beyond the scope of this book, of course, but I go into important nutritional supplement categories for bodybuilders in Section 3.6. Also, please see the **associated references** for more detail on each of these supplements, and recognize that the below list is **not in any way medical suggestion** or a substitute for proper medical treatment by a licensed medical provider.)

- **Curcumin** for cardiovascular health, as well as its antioxidant, anti-carcinogenic, and antiinflammatory effects (765-768)
- **Resveratrol** for anti-cancer(769) and anti-dementia effects(770)
- **Green tea** (extract) as a cancer preventative(708) and for its catechin-derived antioxidant capacity(771) and ability to improve blood lipid profile(772) and

cardiovascular health generally(773-776).

- **IP6** (inositol hexaphosphate) as a possible anti-cancer agent(777-780)
- **DIM** (diindolylmethane) to protect against prostate cancer(781)
- **CoQ10** (or **ubiquinol**) for those prescribed statins or who take red yeast rice extract(782-789)
- **Omega-3 Fatty acids** (see [Section 3.2 above](#)), which are essential in the diet.
- **Herbs** such as echinacea, ginseng or astragalus for immune health(790)
- Herbs with **adaptogenic** actions such as ginseng(791-793), *Schisandra chinensis* (wu wei zi) (794, 795), *Rhodiola rosea* (796-799), ashwagandha(795, 800, 801) and mushroom fungi(802, 803) such as lion's mane(804-806), reishi(807, 808) and turkey tail(809, 810).
- Other herbal medicinals, ideally as prescribed by an appropriately credentialed/licensed (medical) practitioner or with documented scientific viability(811).

3.5 Fine Tuning: Nutrient Timing, Meal Size, Taste and Satiety, Food Variety



After your nutritional basics are in place, the dietary "tinkering" that is often relegated to the "coach" comes into play. These kinds of fine-tuning strategies are likely more important in the Off-Season when pushing the extremes of muscle gain and overall adaptive capacity (balancing training stimulus and recovery), and when nearing the limits of one's gastrointestinal capacity (ability to consume and properly process food). In some cases here, there is as much art as science to understanding an individual's physiological needs in the context of his/her (psychological) relationship with food, food preferences, work and food preparation concerns, cultural background and current cultural setting, food availability, and willingness to eat for bodybuilding purposes in the context of eating for pleasure, social reasons, *etc.* To help you with this dietary balancing act, I'd like to cover how one could fine-tune the following aspects of one's dietary plan:

- Nutrient Timing([659](#))
- Meal Size and Frequency
- Taste, Satiety and Food Variety

Nutrient Timing

This topic is covered in depth in the context of Peri-workout Recovery Supplementation ([Section 3.8](#)). However, nutrient timing refers to the timing of nutrients throughout the entire day in a way that forward one's progress as a bodybuilder or athlete ([659](#), [812](#)), not only the specific temporal association of a relative and specific

peri-workout nutrient overload. Here are some other important timing strategies you might find helpful in coaching your way to being a better bodybuilder:

- Be sure to include an adequate amount (**20-40g**) of **complete** (i.e., **EAA-rich**) **dietary protein** source regularly (every 2-3hr as a **protein pacing** strategy) as an anabolic and anti-catabolic stimulus (see [Section 3.2 above](#)), even on days you don't train, during the hours before a workout or long after a high nutrient density post-workout period.
- Don't be afraid to **include carbohydrate in a late day/ before bed meal** if this helps you sleep, an absolutely vital part of recovery (see [Chapter 3 Special Section on Sleep below](#)). At least when in the process of losing weight, shifting food intake towards the end of the day may mean better retention of fat-free mass(813) and a healthier metabolic state (e.g., improved insulin sensitivity, cholesterol and blood glucose profile)(814) that manifests in greater “metabolic flexibility”(815) [the ability to oxidize (excess) excess incoming food energy, regardless of macronutrient composition.]



Nutrient TIMING GUIDE

**ALL
DAY**

PROTEIN PACING

- 20 - 40g
- High Quality (Leu rich) Protein
- Every 2-3hr

**Pre
WORKOUT**

ACUTE ACTING ERGOGENIC AIDS

- Pre-Workouts
- Nootropics
- Buffers, Adaptogens, Etc.

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**Peri
WORKOUT**

PERI-WORKOUT RECOVERY SUPPLEMENTATION

- Easily Absorbed Sources of
- Protein (EAA-rich)
- Carbohydrate Source

**Other
TIMES**

OTHER SUPPLEMENTS

- Health Supplements
- Supplements that are absorption-limited
- Anti-oxidants (away from workout times)

**Night
B4
BED**

CARBOHYDRATE (POSSIBLY) SLOW "NIGHTTIME" PROTEIN

- Carbohydrate for Sleep
- "Slow" protein (casein a/o protein + fat to slow absorption)

- Include supplements that have an acute **ergogenic** effects (e.g., if you use a “pre-workout” containing stimulants such as caffeine) in your **pre-/intra-workout regimen** and **those that enhance recovery** (such as carbohydrate and protein powders and sleep aids, of course) **post-workout**, and **antioxidants** at times other than peri-/post-workout when, by quenching free radical stress, they might interfere with stimulating adaptation(697).
- Include other general health supplements at optimal times for **proper assimilation** (e.g., before bed or with breakfast), rather than peri-workout when your gastrointestinal tract may be at a disadvantage for absorption(85, 816).
- Fast and “slow” proteins can be used in a nutrient timing context. As noted below in **Section 3.8** on Peri-workout Recovery Supplementation, **quickly/easily absorbed protein sources** such as free-form amino acids rapidly elevate blood amino acid, as well as insulin levels. It seems that using a hydrolyzed protein source peri-workout may provide some advantages, such as more rapid absorption of (some – see below) blood amino acids(817, 818) and greater elevation of insulin(817, 819-822), especially compared to milk(822) and the slow protein(400) casein(823), direct stimulation of glucose uptake(824) and **glycogen synthesis**(825), free radical quenching actions(820, 826) and greater stimulation of protein synthesis compared to an equivalent amount of essential amino acids(825, 827). It’s possible that the extent of hydrolysis and resulting peptide chain length plays a role in the action of protein hydrosylates(828): Shorter chain length in a hydrolyzed whey source may increase total nitrogen absorption(829), but in the range of ~25-50% hydrolysis, one study found no effect on the rate of total amino acid absorption(823). Other studies suggest that native whey may provide leucine(830) and the other BCAAs(831) more rapidly than a hydrolyzed source, but that dipeptide mixtures result in more rapid transport of other the other EAAs (via the pept-1 oligopeptide transporter)(832, 833). This suggests that using a combination of both hydrolyzed and intake (whey or casein) sources could be advantageous for

rapidly providing the full spectrum of EAAs.

- One study of **intra-workout protein** found that combining **protein** hydrolysate (30g over a 2hr workout for a 220lb bodybuilder) with an equivalent amount of **carbohydrate** reversed the negative protein balance when only carbohydrate was provided(834). Using 30g of **hydrolyzed whey pre-and postexercise** (as well as once on non-training days) brought about significant fat loss over 8 weeks of resistance training, where **whey concentrate** fell short in this regard(835).
- On the other hand, don't forget that **more slowly absorbed protein** like (micellar) casein may be useful to maintain positive nitrogen balance during extended periods when meals cannot be eaten, e.g., useful overnight, as a " **nighttime protein**" when sleeping(399-401).

Meal Frequency and Size: Welcome to the Lifestyle

Naturally, for a given caloric and macronutrient intake, the more frequent your meals, the smaller each would be. There are several potential **advantages** that come with eating more frequently:

- Finer resolution of meal/nutrient timing and adjustment. For example, eating more frequent and thus smaller meals adapts itself well with a strategy of **smaller pre-workout food intake** that typically translates into more hunger **post-workout**, thus facilitating larger post-workout caloric intake. Higher meal frequency helps in segregating of macronutrients (e.g., low vs. high fat meals) for purposes of **avoiding GI distress** during a workout (from an overly large and/or fatty pre-workout meal) and **speeding gastric emptying post-workout** (by keeping meal fat content low(516-518)). (Imagine trying to do so with just three large meals/day.)
- For those who are taking in vast quantities of food, **higher meal frequency may realistically be the only way to avoid gastric distress and bloating** (from enormous meals), as well as to fit meals within your daily **time constraints** (work breaks, etc.). For many, this is a practical necessity of eating >20kcal/lb/day, and one that is often overlooked by those critical of a

typical high meal frequency bodybuilding diet (who have perhaps not eaten copious amount of food on a regular basis). It doesn't seem that higher meal frequency increases metabolic rate *per se*(836), or that overfeeding increases resting metabolic rate substantially(837-840), unless, as you might suspect, a high protein diet is followed(841).

- NOTE: Gaining weight does tend to increase activity level, which can help burn off excess calories(842, 843). Indeed, overeating a high protein diet(844), e.g., 25% of caloric intake(841), or simply overeating **does** increase fat-free mass in and of itself even **without training**(183, 185, 841). About 1/3 of the body mass gained over a 100-day overfeeding experiment was fat-free mass (184). This “fat-free mass” is of course not entirely muscle mass(841), but it's interesting to know that the best predictors of more favorable gains of fat vs. fat-free mass include baseline **testosterone levels** and **thermic effect of a meal** (perhaps indicative of a “fast metabolism”)(183).
- Spreading food intake out may prevent the extreme distention (carrying a “food baby” Off-Season) that can lead to a “blown out” waist that some bodybuilders experience after years of consuming massing amounts of food *en route* to extreme muscle mass.
- Greater meal frequency does **not** seem to alter changes in body composition (given limited evidence)(845, 846), but when attempting to lose body weight, it may help with retention of fat-free mass, reduce hunger(845, 847) and improve blood born health markers(845, 848).

Eating more regularly, of course, is not perfect for everyone. There are, of course, some disadvantages:

- Meal preparation requires a bit more effort, and one must be regimented to eat repeatedly during the day.
- Stopping to eat in many situations is not ideal (e.g., during a corporate meeting), but supplements (protein shakes, bars, etc.) can help here. [During long days of training in acupuncture school when I had no afternoon break, I had worked up to consuming ~6000kcal/day during an Off-Season and one of my “meals” was a

1000kcal protein/carbohydrate shake that I would chug all at once mid-afternoon (between “lunch” and “dinner”).]

- Even short trips away from home may require you carry a meal or two with you.
- Organization is at a premium, from preparing each meal to cleaning meal containers and silverware.

Perhaps more than any other aspect of bodybuilding, the **‘round the clock attention needed to optimizing nutrient intake** gives credence to the claim that bodybuilding indeed mandates that one live a particular “ **lifestyle**” to do it properly.

Taste, Appetite and Food Variety

Neuroendocrine control of appetite is an extraordinarily complex phenomenon, governed by both psychosocial (taste preferences, “comfort foods,” social norms, etc.) and biological influences (multiple redundant physiological mechanisms for regulating energy balance)(849). As you may have noticed, the **eating habits** you developed early in life may run counter to those that are best for optimizing your bodybuilding gains (avoiding vegetables, comforting oneself with ice cream, etc.). Many bodybuilders may also be caught in a **body image**-related catch-22 in that they (obviously) desire lean muscularity, even to the point of psychological disturbance [**muscle dysmorphia**(850)], but can't seem to temporarily relinquish extremely low body fat levels for the sake of gaining the muscle mass needed to reach their ultimate goal. Put these things together, and it's possible that both satiation and satiety (meal satisfaction during and after a meal) (96, 851) can be influenced by these complex psychological factors(852).

In short, **unconscious psychological factors** can play a role in your eating behavior in a way that works against you in the long run. Perhaps the most critical application of this is recognizing your own personal, internal (conscious or subconscious) limits in terms of body fat gain in the context of setting reasonable goals. Some level of personal reflection may be appropriate here: Your personal **psychological limit as to how much body fat you will allow yourself to gain** (irrespective of associated adverse health effects that may arise) may preclude gaining the muscle mass you desire, and **being honest** about this can save yourself the frustration of setting goals that are never reached. On the other hand, if your limitations are more physiological, I hope that some of the **below strategies** can

help make “big” Off-Season eating a bit more comfortable.

Strategies to Improve Appetite in the Off-Season

Obviously,



when pushing for more muscle size Off-Season, practical and effective ways to increase your appetite and/or reduce satiety and satiation can be valuable assets. Here are a few strategies to get that done:

- **Variety** is the spice of life and **spices** can put the life back in your diet during the Off-Season. Make your

food taste as good as you can, varying spices, flavors, etc. Additionally, many spices **benefit gastrointestinal function**. For instance, **cardamom** and **cumin** may increase appetite(853) and others such as **ginger**(854, 855), **artichoke**(856) and **clove**(853), that remedy dyspepsia and gastric distress(853) may do so indirectly. Spices that **stimulate bile production and secretion** (to aid in fat digestions and absorption) include curcumin, capsaicin (red pepper), ginger, cumin, fenugreek, mustard, onion, and tamarind(335). Getting creative with the use of condiments, seeking out new sources of foods (e.g., exotic meat sources, vegetables you've never eaten), varying how you cook meat (grill, bake, pan fry, etc.). A trip down the "foreign foods" aisle of your local grocery store, or better yet, to an international grocery store or open market, can lead to adventures in eating that enliven your appetite.

- Keep your **gastrointestinal system as healthy** as you can. This would include eating enough and a consistent habit of **fiber**, pre-and **probiotic** consumption, as well as using digestive enzymes (e.g., bromelain, papain, pancreatin, etc.)(857) as needed. My **empirical observation** is that is that repeatedly eating the same food (e.g., years of chicken breast as a repeated daily staple) can lead too food burnout and what might be considered a food intolerance. On the other hand, eliminating foods that cause true allergic reactions can possibly remedy these issues(858, 859). (If you have a food allergy, please consult with a qualified medical professional.) See **Section 3.2** for more on food intolerances and allergies and **Section 3.4** for more on fiber and probiotics.)
- Eating **nutrient dense foods** means less gastric stretch inhibition of appetite(860, 861) and greater ease in eating larger quantities of food. This might mean, for instance, switching from rice (laden with water from the cooking process) to bagels as a ("dryer") carbohydrate source.
- **Keep to your meal pattern:** Eating on a set meal pattern can help to create an anticipatory ghrelin response(862, 863) and thus your elevate hunger levels at your next planned meal(864). As an **advanced form**

of protein pacing and a way to pack in more calories, if one wakes at night to use the bathroom (I'd not recommend disturbing sleep intentionally do this), a pre-made, nighttime, iced/refrigerated protein (and carbohydrate) shake can be consumed. Again, if this cuts into recovery by disturbing sleep, this strategy can backfire.

- In the Off-Season especially, for the sake of time spent chewing and preparing food, some shift towards replacing meat with (high quality, animal-based) protein powders can be helpful in simply ensuring that a meal's protein goal is met. A typical strategy here is to alternate food-based protein with protein powder (shake) based meals.
- Don't skimp on it, but consider putting your protein later/mixed in your meal. Some research indicates that eating your protein first (protein "preloading" your meals) may reduce appetite(865, 866) in a dose-dependent fashion (867) (the more protein, the greater the appetite suppression). However, due to the importance of protein for bodybuilding (see Section 3.2), be wary of employing this strategy if there is any possibility of you not finishing the last bits of a meal when eating beyond the point of satiation.

Selected Foods and Spices that May Decrease Appetite, Increase Satiety and Promote Weight Loss:

It seems apropos to note here that there are also certain foods that may be helpful when dieting (Pre-Contest Phase), but may disrupt your ability to take in the nutrients needed to make Off-Season gains:

- Peppers (e.g., via capsaicin) can inhibit appetite(868, 869) [but may also remedy gastrointestinal distress (335, 853)].
- Green Tea can also inhibit appetite(869) (See also Section 3.6 below on supplements to promote cardiovascular health.)
- Caffeine may also reduce energy intake(870).
- Nuts, which have high satiety effects, may not be entirely absorbed(871), but may increase energy expenditure (871, 872) and help with weight loss(540).

[Just be wary if nuts are a "trigger food" for you (873)!]

- **Vinegar** may have health benefits (such as improving lipid profile and having anti-diabetic effects(874), but be aware that **apple cider vinegar's effects are controversial**(875), and that it may reduce appetite essentially by creating the sensation of **nausea**(876).
- Potentially **fiber** (a small effect which you may have to determine for yourself)(712, 877).
- As some of you may know quite well, **artificial sweeteners** may help fix a "sweet tooth," i.e., promote satiety and thus lower energy intake (878). (I personally have a penchant for seltzer water, with a splash of lemon and liquid stevia.) However, long-term heavy use of artificial sweeteners **may not** be an effective long-term strategy for keeping weight off(879-881), and could even derange normal physiological control of energy metabolism(882). [The effects of artificial sweeteners on the brain (stroke and dementia) are controversial(883, 884).] [See also discussion of a low FODMAP diet ("P" referring to polyols which include many artificial sweeteners) in [Section 3.2.](#)].

3.6 Fine Tuning: Food Preparation & Supplements as Icing on the Cake

Food Preparation, Spices, Digestive Aids & Gastrointestinal Health

Of course, we want food to **taste good** and provide as much nutrition as possible. Simple things such as cooking your food, as well as how and which home appliances (such as a microwave and blender) you use to process and warm your food can also affect the nutrient content and bioavailability in what you eat. For instance, blending carrot increases the release of β -carotene (885) (suggesting that mechanical digestion – especially **chewing** – is important for nutrient availability). On the other hand, **microwaving** briefly (10s) reduces the β -carotene level in carrots, but increases the release of antioxidants in blueberries(885, 886). However, **microwaving** for blueberries for more extended periods (1min or more; which one might do, perhaps, if warming a frozen blueberry muffin, but rarely if just warming room temperature blueberries) decreases the content of the antioxidant anthocyanin (886). Blueberries suffer the same extensive, **progressive loss of antioxidant power with the extreme heat of boiling** (1-10 min) and baking (beyond 30min), as well as repeated temperature fluctuations after quick-freezing, even if these temperature variations all occur below 0°C(886)! The underlying wisdom here might be to chew your vegetables and avoid overcooking your blueberries.

There are, of course, other examples of how **processing impacts our food's nutrient content, but the effects are not entirely cut and dry (pun intended)**. Cooking generally tends to increase the (phenolic) antioxidant activity of green vegetables(887) and free radical quenching ability of tomatoes and corn(888). However, the conclusions of these studies depend on the measure of antioxidant activity(888) and should consider the possibility that the heat degradation products of known antioxidants may or may not also have antioxidant activity(889). Given that the men reading this might prefer to eschew soy and soy products entirely because of their **phytoestrogen** content, it's handy to know that these controversially healthful isoflavone constituents(890, 891) are eliminated or destroyed by soaking, washing, and cooking(892). [Isoflavone content in fermented soy products like soymilk may vary by the particular probiotic (*L. acidophilus*) strain contained within(893).]

For you green tea lovers (this includes yours truly), keep in

mind that the greater the grinding of green tea (diminishing particle size), the lesser the catechin-derived antioxidant capacity(771). Tea varies dramatically in phenol content(894, 895), as you might have imagined, but brewing(895) and even microwaving(896) assists in extracting the wanted polyphenols from its leaves.

Other than destroying microbes, cooking food (or "browning" it through what is called the Maillard reaction in chemistry-speak) is, of course, another way to enhance its taste (897). However, traditional preparation of proteinaceous food in the presence of carbohydrate can cause in the chemical combination amino acids with carbs, forming what are called "advanced glycation endproducts" or AGEs(898). The level of AGEs found in the various body proteins is implicated in modern maladies like diabetes and cardiovascular disease, not to mention a generally advanced rate of aging. As you might have expected, eating AGEs in your diet also affects the markers of systemic inflammation associated with these diseases(899)! The impact of eating AGEs may hit home even harder knowing that the **"AGE-ing" of food reduces the biological quality of your protein**, e.g., by mechanisms as simple as impairing amino acid absorption(900).



However, spices can help with the above, not only by counteracting the bittersweetness of knowing your beloved grilled honey-BBQ chicken breast contains AGEs, but also because many spices actually reduce AGE formation in the first place(334, 901). It's probably the **variety of phenols, alkaloids, tannins and other chemicals in spices**(901) that explain why spices like cinnamon, ground Jamaican allspice, oregano, garlic, onion and scallion, among many others, prevent AGE formation in a multitude of ways(334, 901).

The above effect on AGEs highlights **only one mechanism whereby spices may exert health benefit s**. Aside from **stimulating digestion** and speeding gastrointestinal transit time(853), which can be particularly helpful simply in making your Off-Season eating efforts more enjoyable, spices may have a positive

effect on intestinal gas (**flatulence**), the impact of **carcinogens** and even formation of kidney and gallstones(335). The take-home message here is to **not skimp on spicing your food** (which may be different than adding copious amounts of calorically dense condiments), even if eating spicy food is not as "hardcore" as a plain, tasteless "bodybuilding" diet.

Lastly, a few other notes and reminders on maintaining gastrointestinal health:

- As I have written about in **Fortitude Training®**, consuming **digestive enzymes**(857), as well as **betaine HCl** (to supplement gastric hydrochloric acid production) to reduce intestinal gas and aid in processing a high fat, large or even dairy (lactose)-laden meal(857, 902-907) is a more direct approach to aid in chemical digestion. Note that digestive enzymes are meant to be used as a **supplement to your digestive systems exocrine function**, not to mask or treat digestive insufficiency, which could manifest as symptoms such dyspepsia, malabsorption (e.g., noted fat in one's stool), or diarrhea(908).
- Of course, maintaining a friendly **bacterial symbiosis** at the other end your alimentary canal (the large intestine) by consuming **pre-and probiotics** (Section 3.4) is also important for optimizing digestion.
- Don't forget **fiber intake**, also covered in Section 3.4, which can include the use of a fiber supplement.

Nutritional Supplements, Ergogenic Aids, Nutra/Pharmaceuticals, Etc.

If you're like many bodybuilders, you probably need little encouragement "cover your bases" by consuming with various dietary supplements, ergogenic aids and nutra-/pharmaceutics(909-911). When it comes to this, I sense that many bodybuilders have **the horse before the cart**, so to speak, in that this sort of nutritional fine-tuning should really **only be icing on the cake** in the overall scheme of one's bodybuilding efforts.

Still, there are several important supplement **categories** I'd like to address here, for you to use as a starting point for **customizing your personal** supplement regimen. Before moving to those categories, I'd like to present some important considerations when it comes to nutritional supplementation.

Some Important General Considerations on Supplementation

A product loaded with dozens of ingredients may be effective, but how will you know which ingredient(s) worked the magic? Additionally, supplements that contain proprietary blends don't provide exact amounts of the active ingredients, but only list them in order of amount from most to least(912) (unless the company explicitly provides those amounts, as does [Granite Supplements](#)). Of course, many products try to win you over with a laundry list of ingredients, and the adoption of current Good Manufacturing Practice (cGMP) does not guarantee that the ingredients are “clinically dosed” (not “fairy dusted”), i.e., are found in amounts and formulations that have been demonstrated efficacious in research(913). Ideally, as well, the advertising for a given product should include scientific substantiation (proper citations and referencing) for (non-FDA approved) claims. (See [Chapter 5](#) for more on being a scientifically-minded, critical thinking bodybuilder and coach.) When possible, my general recommendation is to add in one supplemental ingredient at a time, change nothing else, and give it enough time to take effect, depending on its proposed actions. (E.g., a pre-workout should show results in minutes, an herbal diuretic in hours, but an anabolic agent might require months live up to the hype.)

You might be wondering: “Does it really matter how a supplement works, as long as it does? Gains are gains, right?” True, but if you'd rather not pay for a placebo, which can have steroid like effects(267) [or even worse, a [nocebo](#) where negative expectancies you might develop can end up manifest physically(914))], you can sometimes **go the extra mile**, and find a crafty way to sneak the new supplement into your regimen. For example, one could ask a friend or relative one rarely sees (or don't mind avoiding for a couple of months) to help create placebo-and supplement-loaded versions of a pre-workout to see if one can really tell if a pre-workout stimulant is affecting workout perceived exertion, etc. Several month's daily allotment of pills could be parceled out in mini-sandwich bags, separated into two groups in a way unbeknownst to you (with and without the supplement in question), and consumed with eyes closed, in the dark, or even blindfolded to **“blind” you to the supplement you're consuming**. (These examples may seem silly, but they pale in comparison to the efforts taken to truly blind study participants in research studies.)

As you might expect, when creating a supplement blend, I generally recommend seeking out **particular singular (raw) ingredients** from well-established supplement providers whenever

possible and combining them on your own. This will allow you maintain consistency in your supplement regimen, and manipulate/add to it as needed, rather than rely upon the ever-changing litany of products that come and go with the marketing whims and changing legislation. Mixing individually purchased (raw) ingredients (I suggest using www.truenutrition.com as a starting point) is also a less expensive option in many cases. As an example, you may have noticed that proprietary blend-based fat burners come and go regularly and/or formulations change. Instead of having to stock up on product or seek out new products on a regular basis, you can, over time, devise your a **Pre-Contest fat-burning stack** composed of ingredients such as caffeine, green tea (of a particular, readily available variety), yohimbine HCl, synephrine, *etc.* that be **reliably recreated** and refined year in and year out.

There will be many supplements that come and go and effectively coaching yourself is a matter of being informed and thinking critically. It may be that scanning the scientific literature and reading data tables (e.g., by perusing the Medline Database at www.pubmed.com) or taking your supplements out of unlabelled bottles with your eyes closed really isn't down your alley. **In my opinion, one of the best resources for learning the scientific research landscape upon which a particular supplement sits, including effective doses for different outcomes on human (patho)physiology and performance is the ever-increasing database at www.Examine.com.** Additionally, here is one very simple step you can take to understand a dietary supplement's anatomy better: Each time you come across a new, and especially an unsupported piece of information about a dietary supplement (e.g., many claims you'll see online), just ask, "Where does that information **really** come from and why should I believe it?..." You might be quite surprised what you find out.

Top Supplement Categories for Bodybuilders

This book is far from a complete guide to supplement use, but I've tried to cover some of the "basics" when it comes to dietary supplements, which are, as noted above, in and of themselves mostly "extras" in the grand scheme of the scheme I put forth in the Nutritional Hierarchy of Importance ([Section 3.2](#)). This is not to say that supplementing with nutraceuticals, adaptogens or nootropics don't play a role in bodybuilding, but they can't replace (or "band-aid") solid dietary, recovery and training strategies, in my opinion.

A Note on Sleep Aid Supplements

Sleep is paramount for optimizing recovery from training. (Please see the [Special Section](#) at the end of this Chapter for more on the importance of and strategies to improve sleep) Of course, there are a plethora of supplements that have been sold and tested as sleep aids(915), some demonstrating greater effectiveness in scientific trials (such as **melatonin**(916, 917)] than others [such as valerian(918-920)].

Additionally, singular complementary and alternative medicine strategies can remedy sleep disturbance(921), but it's been my clinical and coaching experience that a **comprehensive** approach to stress and anxiety reduction is most effective. This is not to say that many individuals have not had good success in combating sleep issues with herbal teas, L-tryptophan, kava kava, theanine, GABA, anti-histamines (such as diphenhydramine) and other ingredients found in many OTC sleep remedies. Still, a magical “sleep bullet” is no replacement for addressing your sleep issues with a complete inventory of your sleep hygiene, which would include things such as:

- **Food (carbohydrate) intake** before bed(150-152).
- Being wary of mental state/activities before bed (e.g., relaxing reading vs. stressful online work).
- Limiting bed and bedroom comfort and nighttime light exposure(922).
- Limiting caffeine consumption late in the day(923).

A Note on Health Aids in General

As I note throughout this book, you may feel that certain health-promoting supplements are vital to your bodybuilding regimen (e.g., because of a predisposition to certain health ailments). While I've listed examples of some health-related supplements in [Section 3.4](#), I mention it again simply to remind you to look critically at your supplement choices before “shotgunning” health supplements, especially those that might be **redundant**. For instance, consuming multiple products that have anti-cancer effects via NRF-2 activation [e.g., curcumin, cinnamon, resveratrol, EGCG, sulforaphane, DIM, *etc.* (769)] all at doses that likely to have clinical effects might be considered “overkill” (pardon the pun) in terms of cost-benefit. (For more on this topic, see the [Subsection below on Supplement Stacking](#).)

Nutritional (Non-Pharmacological) Ergogenic Aids & Adaptogens

"NUTRITIONAL"

ERGOGENIC AIDS



CREATINE MONOHYDRATE

(2-5G / DAY)

© Scott W.
Stevenson



CAFFEINE

(3-6MG/KG DOSE)



PERI-WORKOUT RECOVERY SUPPLEMENTATION

(WITH CARBS!)



PROTEIN SUPPLEMENTATION

(TO TOTAL AT LEAST
~1.7G/KG/DAY)



VARIOUS ADAPTOGENS

- PANAX GENUS (GINSENGS, ETC.)
- ASHWAGANDHA
- MUSHROOMS (LION'S MANE, ETC.)
- OTHERS?



HONORABLE MENTIONS

- BETA-ALANINE (2G/D)
- HMB?...

It's likely human *and* most certainly bodybuilder nature to be fascinated with the potential for **nifty exotic substances** and **novel nutritional** twists that hold the promise of greater muscular gains. I am probably as fascinated as you are, but in an effort to counterbalance the current marketplace's focus on fancy nutritional supplementation strategies, it's quite possible that when the bases of your **Nutritional Hierarchy of Importance** in place, many ergogenic

aids may be useless... or worse.

For instance, an ergogenic effect of a pre-workout stimulant that also reduces your appetite, thus causing you to fall short on your macronutrient needs for that day could actually **impede progress** instead of propelling your training gains. Especially for those on a limited budget, ensuring you have an abundance of high quality, **palatable food should take priority over purchasing high-priced supplements**.

I address **critical thinking** about your supplement intake in [Chapter 5](#). The list of **ergogenic** aids that are well supported (in **placebo-controlled** trials) isn't terribly long. Note, too that there is an **interplay** in bodybuilding between **ergogenesis** (promoting greater training performance and thus possibly greater stimulus for muscle growth) and **anabolic actions**, which would foster greater gains and thus have an ergogenic effect. In other words, **that which is anabolic to muscle will be ergogenic** in the context of resistance training and vice versa.

I don't go into great detail regarding the application of the supplements noted below, in part because this information is ubiquitous (and found within the included citations, many of which are available via scholar.google.com). As a good coach (you!) who cares about his athlete (you!), please take the time to peruse the literature and carefully, critically examine whether these supplements are useful or wasteful for your specific bodybuilding efforts. Without further preamble, here are the chief "nutritional" ergogenic aids with well-established track records in the research literature. [I'm leaving out **sodium bicarbonate**, which can be ergogenic during high-intensity exercise (924), but runs such an inordinate risk of gastrointestinal distress(925) that I think it's impractical in the context of a bodybuilding diet.]

- Good old **creatine monohydrate**(926-929) at a dose of ~3-5g(930, 931)per day.
- Potentially **caffeine** in a hearty dose (3-6mg/kg), especially when not used habitually(932-936)
- [Peri-workout Recovery Supplementation \(See Section 3.8\)](#) which would include **peri-exercise carbohydrate**(550, 554, 680, 681)
- **Protein** supplementation (See [Section 3.2](#)), in general(937), and in particular when it elevates protein intake to ~1.6-1.7g/kg/d(395, 396). Additionally, protein supplements that are fast acting (essential amino acids and hydrolyzed proteins) or slowly

digesting can be strategically employed (see [Nutrient Timing](#) above in this Section).

- **Adaptogenic herbs** would, by virtue of their ability to promote recovery, also be ergogenic. Additionally, **unlike stimulants**, adaptogens don't tend to have the **negative drawbacks** of addiction potential, sleep disturbance, rebound hypersomnolence (sleepiness) when coming down(938), which can thus negatively affect performance (794). The list of adaptogens is quite long, but I'll touch on just a few here

Species from the ***Panax* plant genus** have demonstrated adaptogenic actions, alone(793) and in combination(939).

These include ***Eleutherococcus senticosus*** (Siberian ginseng)(794, 940, 941), which may increase aerobic capacity and spare glycogen(942). ***Schisandra chinensis*** (wu wei zi) may, in particular, have a powerful central (brain) anti-fatigue effects (794, 795, 941). The ginsenosides found in ***Panax ginseng*** contribute to their ability to reduce the stress response(941), e.g., by enhancing mitochondrial function and protecting against free radicals(792). *Panax ginseng* has demonstrated a cognitive/attentional effect ins a wide array of studies(795, 943) and can also increase physical performance(793), including muscular strength(795, 943). ***Rhodiola rosea*** (ideally standardized for rosavins and salidroside) also has revered anti-fatigue and ergogenic actions(799, 944). Like other members of the *Panax* genus, it can improve cognitive performance and sense of well-being when life's stresses seem overwhelming, as has been demonstrated in physicians working night shifts(796) and medical students enduring exams(797).

- **Ashwagandha** (*Withania somnifera*, also known as Indian ginseng) is an adaptogen used for centuries in Ayurveda and traditional Indian medicine to relieve stress, promote vitality(945), enhance adaptation and normalize physiological function(946-948). Ashwagandha appears to be both anabolic to skeletal muscle(949) and anti-arthritic(950) in rodent models. Men who supplemented for two months showed increased testosterone, luteinizing hormone and antioxidant status, as well as improved sperm count, motility and metabolism(951-953). Ashwagandha reduced

fatigue and improved quality of life of women undergoing breast cancer chemotherapy (954), and ashwagandha extracts from can reduce cortisol, resting blood pressure and anxiety(945) and have **nootropic** actions(955, 956) – precisely what you need when "diet brain" catches up to you. Ashwagandha extract (1000mg of extract/day x 8 weeks) enhanced performance and aerobic power in hard-training endurance cyclists (800), and only half that dose improved aerobic, anaerobic and muscular power in college students who weren't even training(957). **Most impressive and important for bodybuilders and physique aficionados** , twice daily doses of 300mg ashwagandha extract enhanced strength gain and fat loss compared to placebo, possibly via enhanced muscular recovery (reduced muscle damage) **and** increased testosterone(801).

- Many mushroom fungi, such as **reishi** (*Ganoderma lucidum*)(807, 808) and **turkey tail** (*Trametes versicolor*)(809, 810), may have adaptogenic actions, including strengthening the immune system via their content of beta-glucans(958) and polysaccharide K(810). **Lion's mane** (*Hericium erinaceum*) extract is becoming well known for its nootropic effects. It can both increase alertness during the waking hours while supporting restful sleep at night(959), which is vital for recovery (960). In addition to its beneficial psychoactive(961, 962) effects, it has neurotrophic(804, 963), antioxidant(964), anti-tumor and many other medicinal(805, 806) properties.

- One honorable mention in the ergogen category would be **beta-alanine**, which increases muscle carnosine content over the course of time(965-969) and can thus have an ergogenic effect(967, 970, 971). A dose of about 2g/day or less can modestly increase in muscle carnosine levels (972), but prevent the (mostly unwanted) side effect of skin-tingling(972, 973) caused by higher doses of beta-alanine.
- A final honorable mention supplement would include beta-hydroxy beta-methylbutyrate (**HMB**; ~3-6 g/d) (971, 974-987), although **some data**(988) supporting

its effectiveness **have been called into question**(989) and **effects on trained lifters** may be trivial(975).

Supplements to Aid in Fat Loss (“Fat Burners”)

“Fat Burners” are far from a new entry into the fitness and bodybuilding supplement marketplace(990-992), but the body of literature actually demonstrating (placebo-controlled) effectiveness for these sorts of products is paltry(993). Still, for those with competitive mentality or intense fixation on getting leaner, nearly any evidence, indirect or otherwise, that points toward an enhancement in metabolic rate, lipolysis or the inhibition of lipogenesis is sometimes enough to justify the use of a compound, health risk be damned. Below, I’ll list some of the dietary supplements that are well supported scientifically as fat burners, that I have found to be effective (even in lieu of a strong supportive body of literature), and/or may have promise in the future. To some degree here, I’m appealing to a different “**way of knowing**” (See [Chapter 5](#)) that the scientific literature because the published research is simply lacking in comparison to my personal experience and that of clients I’ve worked with over the years.

I’ve **intentionally NOT recommended doses in some cases below as optimal dosing schemes are not known** and will also depend upon what other supplements you may be using. For instance, combining a caffeinated green tea extract with other stimulant fat burners (e.g., yohimbine) in a shotgunned fashion could prove dangerous. Please check out the resources in [Chapter 7](#) for companies I trust as far as pre-packaged products and sources of raw powders and pills. Also, I consider [Examine.Com](#) to be a phenomenal (and frequently updated) resource for all things dietary supplementation.

- **Carnitine** is a small nitrogen-containing molecule (a quaternary amine), vital for transmembrane movement of fatty acids within the intracellular powerhouses known as **mitochondria** among many other metabolic processes(994). The early research literature was somewhat mixed as to effect of supplemental **L-carnitine** on performance and metabolism(994, 995). (Perhaps, in lieu of deficiency, merely providing more **L-Carnitine** isn’t an adequate driving force to upregulate carnitine acyltransferase formation?) Many studies indeed failed to increase muscle carnitine levels, which is carbohydrate/insulin(996-998) (at **high physiological levels**) and muscle contraction-mediated(999), which is also true for muscle **creatine loading**(1000, 1001). Given enough time (on the order

of months), oral L-carnitine (4g/day) can indeed increase muscle carnitine, fuel metabolism (fatty acid oxidation) and performance(1002). An optimal loading regimen would thus include timing intake with carbohydrate(996, 1003) and exercise(999), and consuming L-Carnitine in the more bioavailable Acetyl-L-Carnitine (ALCAR) form(1004, 1005). Indeed, L-carnitine loading impacts fat oxidation and metabolism round the clock by impacting more than a third of the genes involved in fat metabolism(1006). Given the above, it's not surprising that carnitine supplementation can also enhance recovery [e.g., reduce soreness and protect against free radical stress(1007)] from training(1008).

- **The clinical evidence of yohimbine's fat loss potential is far from overwhelming(1009, 1010).** Its metabolism (pharmacokinetics) is also highly variable(177, 178, 1011), and it can influence cardiovascular dynamics (blood pressure, ejection fraction, etc.) especially when added to a “stack” of ephedrine and caffeine during exercise(1012). **For some people, this makes yohimbine intolerable (and dangerous)** especially if used when exercising (e.g., pre-cardio). A typical research (and Pre-Contest) dose might be 0.2mg/kg(1013) (or 20mg for a 220lb bodybuilder), and while much higher doses have been used experimentally, **I suggest anyone who has not used yohimbine and wants to incorporate it into a body fat loss strategy, to start firstly with a very small (≤ 2.5 mg) dose and add it slowly to determine tolerance.**

- **Yohimbine's** action is to antagonize the alpha2-adrenoreceptors (blocking the inhibition of lipolysis, thus favoring fat oxidation), which opposes the effect of estrogen has on distributing fat to “trouble areas” like the lower body in women(1014). However, this multifaceted gem also increases norepinephrine in the adrenergic synapse, thus turning on lipolysis directly(1015). There is a common concern that yohimbine should only be used when fasted. This is likely rooted in the fact that yohimbine can increase insulin levels(1016, 1017)may further elevate nutrient-stimulated

insulin release(1018), thereby inhibiting lipolysis(1019). Indeed, exercise enhances, and food blunts yohimbine's lipolytic effect (1013) (as is the case for exercise and food when it comes to lipolysis regardless of yohimbine administration), so this should be taken into consideration in the context of (supplement) timing yohimbine intake relative to food. (You've got to eat sometime, and prolonged fasting for the sake of fat burning should consider the possibility of losing muscle and impairing recovery from training, especially during the deepest parts of a Pre-Contest diet.) It also should be noted that the related, more adrenoceptor-specific alpha-2 antagonist compound rauwolscine (aka alpha-yohimbine) also has potential as a fat loss agent(1020) and is sold as such (at the time of this writing).

- **Methylxanthines** such as **caffeine** and **theobromine** found in tea, coffee, *etc.* can increase lipolysis(1021-1024). Caffeine is probably the best known(1025, 1026) energy booster(1027) due to its wide spectrum of ergogenic effects (475, 1028) and because it is both thermogenic(1029) and lipolytic(1030). Theobromine, like caffeine(1031) blocks the adenosine receptor(1032, 1033), but combining caffeine with theobromine may smooth out caffeine's hypertensive (blood pressure elevating) effect(1034, 1035)while enhancing arousal(1036) and mood(1037-1039). A similar compound, **theacrine** can help with mood and motivation to exercise(1040, 1041), although it doesn't seem to increase metabolic rate or fat oxidation unto itself(1042).
- **Green tea polyphenols** (such as EGCG, *etc.*) in **combination with caffeine** can increase caloric expenditure and fat oxidation(1043-1046) and mechanistic evidence suggests that **L-leucine** [which should be in good supply anyway when dieting down(390) – see [Section 3.2](#)] and it adds synergy to a fat oxidation stack of polyphenol + methylxanthine(1047).
- **P-Synephrine** is a molecule found in citrus peel (bitter orange), structurally similar to ephedrine but with comparatively little cardiovascular and central nervous

system stimulation, perhaps because it binds tightly to the β -3 adrenoceptor(1048). In combination with the citrus bioflavonoids naringin (600mg) and hesperidin (100mg), a 50mg dose of p-synephrine **increased energy expenditure** >180kcal(1049). CAUTION: Bioflavonoids such as naringin or naringenin have known drug interactions (1050) (ergo their role in the aforementioned p-synephrine study), which may impact the metabolism of other drugs or supplements in use.

- Supplements that activate the sympathetic nervous system centrally via **capsaicin receptors** (TRPV1 receptors) may modestly impact fat loss(1024, 1051) as well. **Cayenne pepper** (*Capsicum Annum*) fruit extract contains **capsaicinoids** that act via these receptors in the brain to fire up the sympathetic nervous system(1052), elevating metabolic rate via thermogenesis(868, 1053), inhibiting appetite(1054), and possibly driving the formation of new brown fat cells, the energy dissipating adipose tissue found particularly in lean(1055) humans(1056-1060). Capsaicinoid doses as low as 2mg/day ([~3mg are found in each gram of dried red pepper(1061, 1062)]) demonstrably increase lipolysis both at rest and during exercise(1063).
- Similarly to capsaicinoids, **grains of paradise** (*Aframomum melegueta*) seeds (standardized for 6-Paradol) are known to activate brown adipose thermogenesis in rats(1055, 1064, 1065) via those same receptors(1066) in the brain activated by capsaicinoids(1052). 30mg of grains of paradise extract/day has been shown to can increase caloric expenditure ~100kcal/day while reducing visceral fat(1064).

Supplements to Promote Liver Health

Your liver is actually an organ of your digestive system, as well as an organ of detoxification and a major site of metabolism of the blood lipids and associated proteins(85) that have been implicated in cardiovascular health(1067-1069) [Note that there is some scientific dissent on the risks associated with the different lipoprotein fractions (HDL, LDL, etc.)(1070, 1071)]. **Liver detoxification** of xenobiotics (foreign substances such as a drug, supplement, toxin, etc.) is typically broken into two **phases**(1072-1076), and perhaps a **third**

“phase”(1077-1079):

- **Phase I:** Xenobiotics are chemically **modified** (oxidized, reduced, hydrolyzed, etc.) via cytochrome p450 enzymes (designated with CYP") into chemical intermediates, which also causes free radical stress
- **Phase II:** Intermediate metabolites are **conjugated** (chemically bonded) with other chemical groups (sulfation, glucuronidation, acetylation, etc.) so that they can be more easily eliminated from the body
- **“Phase III(1077)”:** (Anti)transporters [such as P-glycoprotein and other multi-drug resistance proteins found in the liver and elsewhere(1080)] coordinate with the induction of Phase I and II enzymes to move (conjugated) metabolites **across membranes** for eventual removal from the body(1077, 1080).

Merely being a heavy consumer of dietary supplements may put you and your liver at risk. It's been estimated that OTC dietary supplements account for >20,000 emergency room visits per year in the United States (1081). While it may never be entirely clear exactly which supplements are injurious to the liver (331, 333, 1082, 1083), several commonly used ingredients and products have been **implicated as hepatotoxic(1084) (toxic to the liver)**. Here is a partial list of those that have been studied/documentated in some depth(331, 1084):

- **Androstenedione**
- **Atractylis gummifera and Callilepis laureola** (African herbs)
- **Black cohosh**
- **Chaparral**
- **Chinese and Ayurvedic herbal medicines (specific constituents)**
- **Germander**
- **Greater celandine**
- **Green tea extract**
- **Herbalife (not all products)**
- **Hydroxycut® (not all products)**
- **Kava**

- Licorice
- LipoKinetix
- Mistletoe
- Pennyroyal
- Pyrrolizidine alkaloids
- Senna
- Usnic acid
- Valerian

Although men may be particularly suspect when it comes to risk-taking behavior(1085), women do not escape the risk of liver injury due to OTC supplements [perhaps due to the prevalence of use of **weight loss products**(1086)]. Also, **herbal formulations** are not *de facto* safe because they are “natural” in origin(1087), which goes for both Western(1088) and Eastern [Chinese(1089) and Indian(1090)] herbs. Perhaps most importantly, it’s possible that supplement formulations contain that **hepatotoxic ingredients not listed on the product label** [e.g., catechins(1091), stimulants(1092) and steroids(1093)] may be found in supplements(333, 1084).] Buyer beware.



Bodybuilders may have even greater **liver stress if anabolic androgenic steroids** (AAS) are used(157, 159, 160, 1094-1096). As you may well know, AAS can adversely affect the blood lipid profile(286, 1096-1099), particularly when non-aromatizing (often 17-alpha-alkylated “**orals**”) compounds are used(1100, 1101). While there is little argument that such changes are often clearly evident(159, 1096) (see **Chapter 2 Special Section on AAS**), determining the exact impact effect of AAS use on the risk and development of cardiovascular disease is a complicated matter(1070), very likely mediated by your genetic proclivities(1102). It should also

be pointed out that drugs to control estrogenic side effects from AAS use [such as **selective estrogen receptor modulators** (SERMs) like tamoxifen and **aromatase inhibitors** (AIs) like anastrozole] also have their own side effects(326), which can also involve liver stress(1103-1105) as well as altered cholesterol profile(327).

So, the evidence is clear that AAS in supraphysiological amounts, especially 17-alpha-alkylated oral preparations, are hepatotoxic. Common effects are cholestasis (1106) (poor bile flow), which impairs appetite(1107, 1108), and, to varying degrees, a condition of blood-filled lesions called peliosis hepatis(1106), which can be life-threatening(1104). Hepatocellular carcinomas and (benign) adenomas have also been associated with AAS use(280, 1109). Many of you reading this probably have read online anecdotal reports of the once legal (in the US) designer steroids [such as Superdrol(1083, 1110, 1111)] by users who complained/ reported greatly elevated blood values of liver damage markers and severe loss of appetite.

Luckily, some supplements may help reduce liver stress, including possibly the stresses of AAS. **Note especially here that neither this book nor its author condone the non-prescription use of AAS where prohibited by law. Also, this book is not a substitute for or a form of medical advice. Please consult a medical professional if you suspect you have health problems, including liver disease.** [You might also remind him/her that resistance exercise in and of itself can cause highly pathological liver function tests for up to a week after a t(1112).]

Legalities aside, the above disclaimer is important because the enormous variety of possible (perhaps unknown) hepatotoxic effects of supplements or steroids (331, 1084) simply can't be neutralized by consuming the "right" laundry list of supplements. Liver disorders, as with much of medical science, mandates specificity of treatment (a "differential diagnosis") depending on the nature of the medical issue. That being said, free radical stress is a common component of hepatotoxicity due to xenobiotic (foreign) substances (1113, 1114) and antioxidants such as polyphenols (as in green tea and turmeric), carotenoids (such as astaxanthin) and other molecules such as sulforaphane have proven effective, for instance, in treating fatty liver disease (1115) [which may be increased with AAS use(1116)]. Also, ensuring a **healthy diet**, replete with vitamins A, C, E, the B vitamins, Zinc, Copper, Molybdenum, and Selenium, due to their roles in liver detoxification processes, can benefit the liver (1075) (perhaps via multi-vitamin/multi-mineral supplementation in some cases). Below are some **OTC supplements** that have hepatoprotective effects via this and other mechanisms.

- **Tauroursodeoxycholic acid (TUDCA, i.e., Taurine conjugated with UDCA):** TUDCA has a number of physiological effects [including antioxidant actions(1114, 1117)], and has been used to treat a variety of liver diseases, including cholestasis, fatty liver and cirrhosis(1083, 1118-1120) in doses of ~500-1500mg/day. However, even in small doses (<20mg/day)(1121) TUDCA can reduce enzymes of liver stress (ALT) and stimulate the proliferation of liver cells. [*Note that **high-dose TUDCA** may reduce HDL (“good” cholesterol) levels(1119).]
- **Taurine itself is worthy of mention here,** as it seems to have cytoprotective effects (1075, 1122-1129) and it could even be considered a “conditionally” essential(1123) nutrient. A recent study in rats(1130) administered a substantial dose of nandrolone [10mg/kg/wk; or, translating from rat to human, ~1.6 mg/kg/wk or perhaps 160mg/wk for a 220lb bodybuilder(1131)]. As expected, nandrolone reduced testicular size and endogenous testosterone output. However, when taurine was co-administered [100mg/kg/day or about 1.6g/day for a person(1131)], these effects of nandrolone were substantially reduced. [In this study, **taurine** restored the testicular enzymes involved in steroid production and reduced the DNA damage brought on by the nandrolone by acting as an **antioxidant** and **antiinflammatory**, thus preventing Leydig cell death. Taurine has also prevented the negative impact on sperm quality in studies of other toxins(288).] Another rat study found that taurine partially reversed the hypertensive effect of nandrolone at least in part by inhibiting angiotensin converting enzyme activity(1132).
- **Alpha Lipoic Acid (ALA):** ALA is known especially as an **antioxidant** [but with prooxidant effects in high doses (695)], that also induces an increase in cellular antioxidant defenses (1133), functions as a glucose disposal agent/insulin sensitizer, anti-obesity agent and activator of AMPK (the cellular switch for turning on energy turnover)(1134-1136). As a bonus, ALA may even aid in creatine uptake(339). It has demonstrated promise in treating many diseases that involve **free radical stress**, such as diabetes, cancer, cardiovascular

disease and diseases of neurodegeneration(1137), and thus protects against liver injury via a number of mechanisms, such as in the event of alcohol, mushroom, heavy metal or carbon tetrachloride poisoning (1138). [Doses are typically on the order of 300-600mg/day, depending on the reason for using ALA, with the R-stereoisomer being preferable due to its greater bioactivity(1139).]

- **N-acetylcysteine (NAC)** is a powerful antioxidant and antiinflammatory agent(1073), which is why it has been used to treat liver fibrosis(1140), a possible result of cholestasis, and cholestasis itself (1141, 1142). Indeed, emergency medical treatment with high dose NAC (24,000mg/day administered orally) has been used (under medical supervision) in emergency medicine to treat hepatotoxicity due to a supplement (containing evodiamine)(1143) and is the standard course of action in dealing with acetaminophen overdose (1144-1146). Note here, as with TUDCA and ALA (see above) that **more is not necessarily better**: Doses as high as 1200mg/day have been shown to improve pulmonary function (in COPD)(1147), but research in rodents suggests that megadosing NAC can actually bring about hypoxia and thus cause pulmonary hypertension(1148).
- **Silymarin. Milk thistle** and its extract, silymarin (which contains silibinin), is useful in treating (alcoholic) liver cirrhosis (reliably lowering transaminase levels), and may help in cases of mushroom poisoning and some cases of viral hepatitis (1149). Silymarin has antiinflammatory actions as well as via (you guessed it) its free radical quenching actions(1149), as well as anti-cancer activity(1150). It's ability to reduce toxic stress has been tested in a variety of circumstances(1149). Silymarin works so well that it's been used as an experimental standard of comparison when examining the ability of other compounds to lessen hepatotoxicity. For instance, **ginger** is comparable to silymarin in combating fibrosis and various adverse effects of experimental toxins [carbon tetrachloride (CCl₄)] that elevate hepatic free radicals(1151). **Beehive propolis** extract has similar effects and is perhaps even more effective than silymarin in this regard (1152)

- **Liver 52** (aka Liv.52 or Liv_52, and LiverCare by [Himalaya Health](http://www.himalayahealth.com)) is a combination of 6 Ayurvedic herbs that have been studied extensively and become a staple in the repertoire of many bodybuilders. (Publications can be found in the Indian scientific journals – See Himalaya's website for more information: www.himalayausa.com) Generally speaking, it's been found effective in managing viral **hepatitis**, alcoholic liver **cirrhosis**, and the toxicity of chemotherapy(1153).

Like silymarin, it reduces the harm brought on by CCl₄(1154, 1155) and is even more effective than silymarin in reducing drug hepatotoxicity(1156, 1157). Like NAC, Liv_52 reduces acetaminophen toxicity(1158). Perhaps more important for bodybuilders who might be using statins [or perhaps even other compounds such as red yeast rice extract(1159-1161) which shares statins' mechanism of action –inhibition of the HMG-CoA reductase enzyme(787, 1162, 1163) – and may even actually contain the prescription drug Lovastatin(1164, 1165)]: **Liv_52 reduces the negative impact of statins on the liver(1166)**. Indeed, Liv_52 may even **improve the loss of appetite** secondary to hepatic stress(1167) (not that I'm suggesting using Liv_52 as a band-aid cure). Of course, as you might have guessed once again, the benefits of Liv_52 are very likely derived from its ability to upregulate the liver's **own antioxidant defense system(1168, 1169)**.

- **Food Ingredients to Aid in Liver Health.** The above list is far from complete, and we mustn't forget that **healthful dietary practices** form the foundation of the **Nutritional Hierarchy of Importance**. For instance, phospholipids (e.g., phosphatidylcholine and sphingomyelin) found in food such as safflower, egg and fish roe, as well as omega-3 fatty acids(1170, 1171) have therapeutic value in treating nonalcoholic fatty liver (steatosis). Polyphenol compounds like the catechins of green tea (and its extracts)(772) improve blood lipid profile, and the same holds true for chlorogenic acid found in coffee, in part via its actions on hepatic lipoprotein metabolism(772). Unfortunately, there is only very scanty and to date inconclusive literature on the effectiveness of **commercial liver detox dietary/supplement regimens(1172)**.

- **Eating Organic:** Indeed, eating USDA-certified foods can limit one's exposure to pesticides and antibiotic-resistant bacteria (1173, 1174), keeping your liver happy. As organic food gains in popularity (in the US and the rest of the world), we can derive hope from the French Food Safety Agency(1175, 1176), in operation since the late 1990's. They report that that organic plant products contained more dry matter, minerals (Fe, Mg) and antioxidant micronutrients (Vitamin C, phenols and salicylic acid), that organic animal products are higher in polyunsaturated and lower in saturated fatty acids, and that nearly all organic food in their country (94–100%) is pesticide free as of 2009.

Supplements to Promote Cardiovascular Health

Cardiovascular disease (CVD) causes the death of nearly 20 million people each year worldwide(1177). While we know that exercise and fitness reduces this risk(1178), pushing the limits of body size [and perhaps body fat(1179)], which often means risking hypertension(1180), is associated with the cluster of metabolic aberrations known collectively as “**metabolic syndrome**” (e.g., poor insulin resistance, abdominal adiposity, chronic physiological stress, etc.) that is associated with increased risk for CVD(1181). It's beyond the scope of this book to provide a complete resource of evaluating one's risk of metabolic syndrome or cardiovascular disease, but paying close attention to the following clinical measures(1181) (**in conjunction with your physician**) is prudent:

- **Body weight or Body Mass Index** [BMI in kg body mass/ (meters height)²]: Naturally this will be higher in most bodybuilders, so body fatness should be considered.
- **Abdominal Obesity** in particular due to the accumulation of visceral fat (around the organs)
- **Family History**
- **Blood Lipids:** Elevated Triglycerides and/or low HDL cholesterol
- **Blood Pressure:** > 140/90 mm Hg(1182)
- **Insulin Resistance/Blood Glucose:** Fasting blood glucose, glucose tolerance tests, HbA1C(1183), insulin resistance assessment (HOMA)(1184).

A **physician can help** determine the utility of other measurements associated with CVD risk, such as:

- Genetic proclivities [including the use of techniques such as genomic analysis and metabolomic signature (1185)]
- Markers of coagulation(1186)
- High sensitivity C-reactive protein(1187)
- HDL and HDL particle number(1188) as well as HDL cholesterol efflux(1189)
- LDL subfractions(1190)
- Various apolipoproteins(1191-1194)
- Endothelial function tests(1195)
- Coronary artery calcium score(1196)
- Other tests(1197)

Below is a **partial list** of supplements that may have **cardioprotective** effects and benefit the cardiovascular systems, e.g., by helping prevent thrombotic events (vessel blockage) or embolism (clot in the circulation that could result in heart attack, stroke, pulmonary embolism, etc.), as well as reducing blood pressure and improving lipid profile. **I have intentionally not included dosages here as this list is not intended to constitute a prescription for cardiovascular health, and you should (as with all medical conditions) consult with your physician before embarking on a program of prevention and/or treatment of cardiovascular disease(1198).** Indeed, taking all of these supplements would likely be overkill and elicit perhaps unpredictable side effects including liver stress. (*Please see the note below, after the list of supplements in this subsection, regarding “cardiovascular supplement stacking.”)

- Several of my clients have had good success, in conjunction with physician guidance, using a supplement (called a pharmaceutical on their webpage) by Himalaya Wellness called **Abana®** (or **HeartCare®**) to improve blood lipid profile. More than a dozen studies(1199) (published over several decades) suggest that this Ayurvedic formulation has a pluripotent effect on the development of cardiovascular disease. For instance, HeartCare® can lower blood pressure(1200), improve lipid profile by lowering triglycerides and total

cholesterol and raising HDL(1201-1203), and reduce angina (chest pain) in those who are already symptomatic for heart disease(1204). Abana® contains *Terminalia Arjuna* (available by itself as a product from Himalaya Wellness) effective by itself as a cardi tonic(1205) with minimal risk for interaction with pharmaceuticals(1206).

- As covered above in Section 3.2 on dietary fats, consuming the **omega-3 fatty acids EPA and DHA** on the order of just 1-2g [EPA + DHA] in the form of krill oil, fish oil or eating arctic fish itself, can reduce the risk of cardiovascular events (including death) by about 30%(456). Recently-derived evidence from the Framingham Heart Study suggests that omega-3 status (i.e., that which could be significantly improved from consuming about 100g of farmed salmon or ~4 typical fish oil pills per day) may be even more important than total cholesterol in predicting death from cardiovascular disease and, perhaps more importantly, all-cause mortality(1207). However, the picture of fat intake to enhance cardiovascular health is complex. **Simply supplementing** with omega-3 fatty acids **may not reduce the risk of cardiovascular event-associated death**(534). The omega-3 alpha-linolenic acid (ALA) does not seem to have the lipid-lowering(482) or cardioprotective effect (1208) of the marine polyunsaturated omega-3's (EPA and DHA), probably in part because the former converts only poorly to the latter(483-486). However, it's likely the **lignan** (secoisolariciresinol diglucoside) **content** of flax that imbues this plant source of ALA with cardioprotective effects(481). On the other hand, omega-6 fatty acids (e.g., the essential linoleic acid) have cardioprotective effects when **replacing saturated fats – generally speaking**(1209). Still, because of the generally proinflammatory actions of omega-6 fatty acids [a notable exception being gamma-linolenic acid(477)] consumption should be balanced with antiinflammatory omega-3 intake(1210). Generally, the fats from olive oil, nuts and milk/dairy products are also cardioprotective(1209) and **coconut oil**, although largely composed of saturated fatty acids(469), appears to be heart healthy(466-468).]

- The consumption of **green tea**, an unfermented tea [as opposed to black tea(1211) that is high in polyphenolic flavonoids, particularly the catechins(1212), is strongly associated with cardiovascular health [epidemiologically(773-776)]. This seems to be due to its antiinflammatory, antioxidant effects(708), as well as its ability to favorably alter postprandial lipemia (reduce blood lipids after a meal)(1212), blood lipids in general (total and LDL cholesterol)(1213), blood pressure(773), and endothelial function(775). A recent meta-analysis suggested green tea drinkers suffer less CVD and intracerebral hemorrhage or cerebral infarction, and there may even be a dose-response association between green tea and lowered risk of myocardial infarction (heart attack) (1214). Even so, a literature review concluded that the quality of the studies and risks of heavy metal contamination and toxic degradation products of improper storage preclude the U.S. Food and Drug Association's approval of the claim that green tea promotes cardiovascular health(1215). As noted above, **there have been reports of hepatotoxicity associated with consuming green tea products(331)**, but the exact nature of the toxicity is not known(1084). Although green tea catechins can indeed be toxic(1216), a study of the catechin content of dietary supplements associated with documented cases of hepatotoxicity did not find a relationship (1091). **The bottom line:** Modest intake of green tea while monitoring liver health seems prudent.
- Two supplements, one a veteran [**red yeast rice extract(787); RYR**] and the other more of an up-and-comer [**citrus flavonoids** such as those found in **citrus bergamot(1217-1219)** – see below] on the supplement scene act as **inhibitors of HMG Co-A reductase**, the mechanism whereby **statins** reduce cholesterol and influence blood lipoprotein levels(1162). Indeed, one of the active compounds (monacolins) in RYR is monacolin K, chemically identical to the prescription statin drug Lovastatin(1220), and scientific studies suggest RYR improves blood lipids similarly to statin therapy(1221, 1222), and can also protect against adverse cardiovascular events(1223). [Unfortunately, the reported cardiovascular protective effects of prescription statins, albeit statistically significant(1224),

actually suggest, in one account, that 86 people would need to be treated over 5 years to prevent only 1 non-fatal cardiovascular event(1225). Similarly, the practical significance of treating 200 people per year to prevent just one fatal or non-fatal heart attack, unstable angina or sudden cardiac death has been called into question(1226). Moreover, there is evidence that **statins may play a causative role in human heart failure**(1227) and that high cholesterol may protect against atherosclerosis(1070).] An additional hurdle for those seeking a pharmacologic effect is that the monacolin content in store-bought RYR may vary over a 20 fold range(1220) and be minimal in some products(1164). On top of this, over-the-counter RYR may contain the fungal toxin (1220) citrinin is found in many OTC RYR products(1228). The **bottom line** here is that OTC **RYR supplementation** is probably not the wisest first course of action for preventing cardiovascular disease.

- **Citrus bergamot** has hypolipidemic and antioxidant effects (1229, 1230), comparative and additive to the effect of statins on improving the blood lipid profile in humans (1231). (The aforementioned study tested 500mg of a bergamot juice derived polyphenolic fraction(1231). I'm not aware of any studies examining the active polyphenolic fraction of store-bought bergamot supplements, so buyer beware.)
- **TAKE NOTE:** It's become increasingly known that statins increase the risk of myopathy (pathological muscle tissue): Up to 5% of subjects register complaints in clinical trials(1232), and as many as 1 in 5 patients report this side effect in medical practice(783). The symptoms may range from simple muscle pain (myalgia) to quite severe (sometimes exercise-related) muscle breakdown (i.e., rhabdomyolysis). Unfortunately, it's uncertain exactly how statins may be causing this myopathy(783). It's been suggested(783) that statin interference in CoQ10 metabolism(1232) may cause myopathy(1233). As if the risk is myopathy isn't bad enough for you and me, disrupting CoQ10 synthesis also impairs mitochondrial function(782).

Additionally, statin use can actually prevent the normal increase in muscle mitochondria brought on by endurance training(1234). Indeed, medically documented case studies(1220) do in fact demonstrate an association between RYR and myopathy(786, 1161, 1235) as well as hepatitis [just like other statins(1160, 1220)]. (Given the statin-like effect of bergamot polyphenols, it's possible they may also carry this risk.) Thus, **supplementation with CoQ10** [at 200mg/day(1236)] would be prudent and has been recommended by some(1236), but not others(782) to prevent myalgia if one is compelled to use statins (OTC or otherwise). Still, a recent meta-analysis suggests CoQ10 supplementations does not prevent statin-induced myalgia (1237). However, low vitamin D status is also associated with statin-induced myalgia(1238) and replenishing this hormone (via oral supplementation) has been shown to reverse this side effect(1239). Lastly, because of their root action in impairing cholesterol and thus steroid hormone biosynthesis, statins may lower testosterone(1240) and increase the risk of gynecomastia(1241).

- Citrus flavanones (a kind of flavanoid that is chemically-speaking a ketone) such as **naringin**, **naringenin**, and **hesperidin** have a number of actions that may benefit the cardiovascular system (antiinflammatory, antihypertensive and antioxidant effect, in addition to **lipid-lowering** and insulin-sensitizing effects) (1242, 1243), and their intake is inversely proportional to cardiovascular disease(1242). However, clinical data is lacking as to how one might specifically prescribe these compounds for cardiovascular benefit(1242, 1244). NOTE that naringin(1050) (found in grapefruit juice, for instance) and hesperidin(1049) **can affect drug metabolism by interfering with hepatic p450 enzymes(1245-1247)**, so caution should be taken (**and medical advice sought**) when considering supplementing with these citrus derivatives.
- **Curcumin**, a component of **turmeric** (1248), can also improve cardiovascular health by improving lipid

profile(1249), and possibly by inhibiting HMG-CoA reductase(1250) and/or reducing the expression of this enzyme of cholesterol biosynthesis(1251), increasing the excretion of dietary cholesterol(1252), increasing LDL receptor density(1251), thus mediating LDL uptake out of the blood(1253), and by improving vascular endothelial health(1254) and insulin sensitivity(1255). Curcumin also seems to have a plethora of other health benefits, including antioxidant, anti-carcinogenic, and antiinflammatory effects (765). [Additionally, this potential “wonder supplement” may even prevent muscle wasting(1256)]. Perhaps because it reduces protein breakdown(1257), curcumin also helps with the rebuilding muscle mass upon reloading, either after a period of inactivity(1258) (such as a layoff from the gym) or after a traumatic injury(1259).]

- However, bioavailability issues have been a focus of supplemental curcumin formulations(1260-1264), Phytosomal formulations(1260), the addition of pepper extract(piperine)(1262), as well as nano-formulations have been applied to remedy this issue(1265). Note, too, that curcumin also affects the gut microbiome(1266), the metabolism of which is involved in cardiovascular disease risk(1267). In other words, curcumin might exert its healthful effects in part by altering the microbiome(753, 1268) (as opposed to being absorbed and distributed via the bloodstream) so maximizing curcumin absorption may not be vital to harness its cardioprotective effects.
- Nonetheless, oral bioavailability of curcumin is a viable concern. The addition of piperine (5mg) to the C3 Complex curcumin ensures bioavailability(1262, 1269) and inhibition of prostaglandin formation(1270). This combination (500mg C3 complex + 5mg piperine, 2-3/day) seems to have at least an anti-arthritis(1271) and antioxidant(1272, 1273) , but not a marked systemic antiinflammatory effect (1271). A Japanese product called theracurmin elevates blood levels ~30-fold higher in rodents and man than raw curcumin(1274), and is orally effective (and more effective than regular curcumin) in medical

applications tested in rats(1275) and humans(1274, 1276). Similarly, BCM-95®, aka Biocurcumax has a bioavailability of 96%, when taken on an empty stomach(1274, 1276). Anecdotaly, using 400-800mg of BCM-95 (available from several companies) has an antiinflammatory/analgesic effect for many people (clients, friends and myself) on par with an NSAID such as aspirin.

■ **Berberine** is an **AMPK activating**(1277-1279) derivative of several Chinese herbal medicines(1280) that has glucose lowering effects(1279) and other metabolic effects (including, unfortunately for bodybuilders, the inhibition of the mTOR enzyme complex responsible for protein synthesis) that compare favorably to those of the diabetic drug metformin (Glucophage) (1277). Unlike statins, it upregulates the LDL receptor(1281), in addition to its antiinflammatory(1282) and mitochondria-protective actions(1283). A recent meta-analysis found berberine effective in lowering total and LDL cholesterol and blood triglycerides and increasing HDL cholesterol(1280) among other atheroprotective actions(1284). Note too that like metformin (and **resveratrol**), berberine activates AMP Kinase (which senses energy demand) by impairing mitochondrial function(1285, 1286).

• Thus, it's possible that berberine's cardiovascular benefits may come at the cost of handicapping cellular energy balance (impairing mitochondrial function and inhibiting protein synthesis) and thus muscle growth potential in the same ways(1287-1290) that concurrent endurance exercise training can interfere gains in muscle mass(1291). [See **Section 3.7** below for more on AMP-activating, glucose disposal agents (GDAs) and muscle growth. Also, see the Special Section at the end of this chapter for more on **Cardio in the Off-Season**.]

■ **In general, AMP Kinase activating xenobiotics** (chemicals foreign to the body) and cytokines such as leptin, ghrelin, IL-6, etc.) likely have cardiovascular health benefit by triggering adaptations brought on by altering energy balance in the heart and vascular tissue

(1292). All Activators of AMPK are not created equal, however: **Curcumin** (see above) seems to favor muscle mass and has other cardiovascular-health benefits, whereas alpha-lipoic acid may have a muscle wasting effect over time (1135).

- **Resveratrol** is a polyphenol constituent of red wine(1293), known for its potential antiaging, anti-cancer, antiinflammatory and antioxidant actions, primarily explored *in vitro* and in animal models(1294, 1295). Resveratrol is an activator of AMPK(1296) and (thus) an inhibitor of mTOR(1297, 1298) that powerfully antagonizes the adverse metabolic effects of a high-calorie diet (in mice), which can mean increasing insulin sensitivity, but also reducing the anabolic signaling IGF-1 and mTOR(1296). Like curcumin, however, resveratrol may help one regain muscle mass after disuse(1299) and chronic inflammation(1300) perhaps via an anti-proteolytic effect(1257) or an anabolic effect on myogenic processes(1301) involving satellite cells(1302). Interestingly, it's been found that resveratrol may limit cardiovascular benefits of endurance exercise in healthy (**human**) individuals(1303), although this study is controversial(1304), and another study **in humans** failed to replicate the metabolic effects (including those of increased insulin sensitivity) seen in rodent research(1305).
- Lastly, the components of the traditional Chinese medicinal **Jiao Gu Lan** (*Gynostemma pentaphyllum*) activate AMPK, increasing both fat oxidation and glucose uptake(1306), promoting a loss of body fat and reduced cholesterol in mice(1307) and humans without any loss of fat-free mass(1308).

■ So, it seems that an **overreaching condemnation** of using AMPK-activating supplements like berberine while trying to gain muscle mass is **not immediately forthcoming in the research literature**. Anecdotally, I have known many to use alpha-lipoic acid while making muscular gains and it seems that curcumin, resveratrol, and Jiao Gu Lan tea may [like metformin (1309), but not alpha-lipoic acid (1135)] be anti-catabolic when it comes to skeletal muscle in atrophic

conditions. For more on the potential of **AMPK-activating supplements** (as glucose disposal agents) to **limit muscle gain**, see [Section 3.7](#) below.

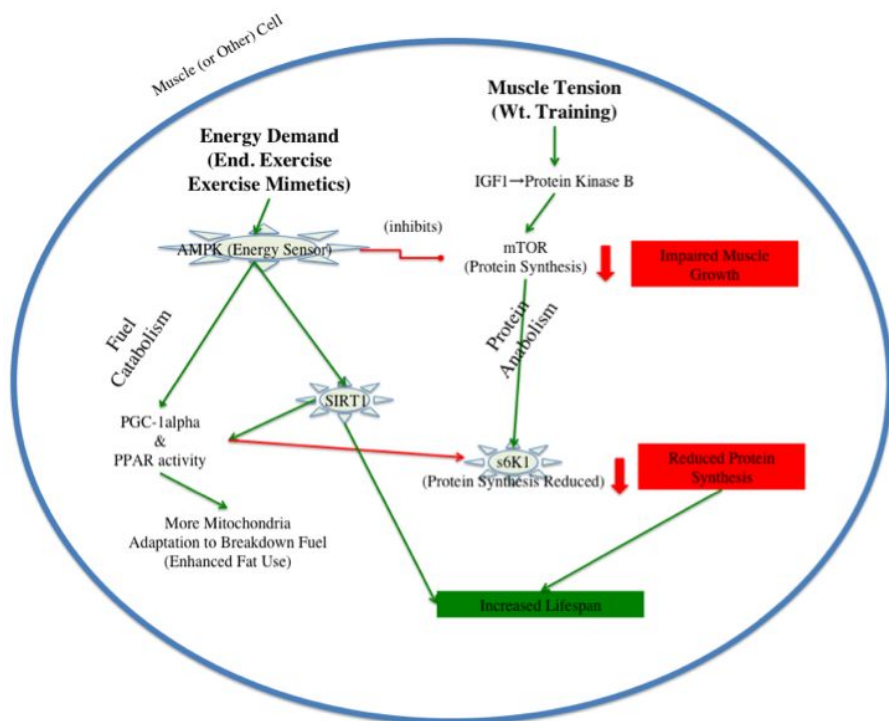


Figure 12: Interaction of AMPK and mTOR in skeletal muscle [in the context of muscle weight training, activation of AMPK, and lifespan effects of substances like resveratrol and curcumin(767, 1296, 1310-1313).]

There is a multitude of other nutraceuticals/supplements that are cardiovascular-protective with reams of evidence far too innumerable to present here in depth, so I'll just briefly mention some others you might consider:

- **Sulforaphane** , found in broccoli and Brussel sprouts, activates nrf2 (turning on our own cellular free radical defense systems) and thus has antioxidant actions that promote vascular health (1314).
- **Indian gooseberry** (a.k.a. **amla**) has powerful antioxidant properties(1315, 1316) and improves markers of cardiovascular risk(e.g. C-reactive protein levels)(1317) and blood vessel function(1315, 1318, 1319).
- The (hydrolyzed) dairy protein-derived

lactotripeptides (particularly Ile-Pro-Pro and Val-Pro-Pro) normalize blood pressure(1320) by inhibiting angiotensin converting enzyme (ACE)(1321, 1322). Doing so (and/or blocking the angiotensin II receptor) also improves insulin sensitivity – vital for muscle blood flow and a good pump in the gym(1323, 1324) – and protects muscle cells (and their mitochondria) against age-and free radical-related dysfunction(1325-1327). Using hydrolyzed whey peri-workout may also aid in fat loss(835). There's an extra plus to seeking out **hydrolyzed dairy protein**: The potential ergogenic effects of lowering ACE activity(1328-1331) are so evident that ACE inhibitors were at one time on the chopping block as doping agents(1332)!

- **Dietary nitrate** (e.g., as found in **beetroot juice** or power) has antihypertensive effects(1333, 1334).
- **Garlic** (especially aged garlic) is known to reduce blood pressure (both systolic and diastolic), total cholesterol, C-reactive protein (a marker of inflammation) and coronary calcification and improve arterial stiffness(1335).
- **As noted above, CoQ10** is depleted by statins, which may explain in part why statins may **not** be beneficial for cardiovascular health(1227), and CoQ10 supplementation during statin therapy improves inflammatory and antioxidant status(1336). Data on CoQ10 and heart disease are sparse, rendering it as more of an adjuvant (and not primary) therapy for preventing and treating heart disease (1337-1339). (Solubilized forms of either ubiquinone or ubiquinol (the reduced form) are most bioavailable(1340), but novel formulations that promise greater absorption are available(1341, 1342).
- **Optimizing one's status via blood testing** (not just simply supplementing blindly) of the steroid hormone **Vitamin D** is vital to health in many ways, as deficiency shows up as a risk factor for poor bone strength, autoimmune disease, cancer, and diabetes, as well as cardiovascular disease(1343-1345). Supplementing those deficient in (25-hydroxy) vitamin D improves cardiovascular disease mortality(1346) [and may reverse statin-induced myopathy(1239)].

Although several mechanisms may be at play here(1347), why vitamin D deficiency is so harmful on the cardiovascular system isn't entirely clear (1344), although the proclivity for Vitamin D deficiency does seem to have a substantial genetic basis(1348). [As a related note, one large-scale study and a meta-analysis found that calcium supplementation, regardless of the addition of vitamin D, increases the risk of myocardial infarction and stroke by about 15-30% (1349, 1350).

- **Generally**, it seems that **supplementation with direct antioxidants** [as opposed those compounds that activate the antioxidant response element (ARE), i.e., act indirectly to improve antioxidant status] **does not in and of itself seem to protect the cardiovascular system(1351-1353)** [and not any more than a **diet rich in fruits and vegetables(689, 1354, 1355)**]. On the other hand, the list of biologically active molecules that **activate the ARE** is likely a familiar one, if you've been reading along in this chapter, as it includes plant extracts(1356)), many food components and spices(701), including cinnamon(707, 1357, 1358), **garlic(704, 1359, 1360)**, **curcumin**, carnosol (found in rosemary), and polyphenols such as **resveratrol**, quercetin and **EGCG** (a primary catechin polyphenol found in green tea)(705, 708).

Supplements that Promote Renal (Kidney) Health

A healthy cardiovascular system means, among other things, freedom from dyslipidemia and hypertension, which may be secondary to some other medical condition or "essential hypertension," of unknown etiology (>95% of cases) (1182, 1361). On the other hand, chronic kidney disease (CKD) [characterized by poor glomerular filtration(1362)] affects more than 10% of the US population(1363) and is strongly associated with cardiovascular disease(1362, 1364). Dyslipidemia(1365) and hypertension (like diabetes and proteinuria) are an independent risk/causative factors for CKD(1363, 1366). Hypertension also results in the progression CKD (1367), so ever-rising blood pressure could very well represent renal disease spiraling toward renal failure(1368).

Because of these associations with cardiovascular health, excepting the possible supplement (or drug) that has cardiovascular benefits but side effect specifically detrimental to renal health, one can "safely" assume that cardiovascular health favors renal health and

the information provided in the above Subsection on cardiovascular risk factors is relevant here. It's likely that many of you reading have/will consider using AAS, which have specifically been known to adversely affect cardiovascular (see above) and renal function. More specifically, steroids can cause dyslipidemia(286, 1096-1098, 1099, 1101) and elevate blood pressure(277, 279, 1098, 1369). The oral ("designer") steroid Superdrol® has been implicated in two case studies with renal toxicity (and cholestatic jaundice) (1370, 1371) and boldenone has associated with renal impairment [elevated creatinine/reduced (estimated) glomerular filtration rate](282). Another study examined 10 AAS-using bodybuilders diagnosed with focal glomerular sclerosis (associated with CKD(1367)), which attributed to elevated body mass and toxic effects of AAS(281). [Most of these bodybuilders had been hypertensive, and only one did not have renal arteriosclerosis. The authors attribute the kidney body mass and toxic effects of AAS (281).] Finally, there are two case reports connecting AAS with renal cell carcinoma(1372, 1373), and renal complications secondary to rhabdomyolysis in an AAS-using bodybuilder have been reported(1374).

Again, dietary supplementation is no substitute for proper medical treatment: If you have a medical issue such as hypertension or know chronic kidney disease (or any other medical disorder for that matter), **please consult a physician and obtain proper medical treatment.** I have known many bodybuilders who (wisely) have used blood pressure medications, for instance, so please do not put your health at risk by trying to self-medicate with dietary supplements. [As a side note, blood creatinine is typically used to estimate glomerular filtration rate(1375), but creatinine levels can be elevated simply because one has a **large amount of muscle mass**(1376, 1377) and the use of **creatine supplements**(1378-1380).] The above being said, here is a short list of (additional) supplements, some of which I've mentioned previously, that may improve your kidney health, through various mechanisms:

- As noted above in the sections on supplements that promote liver and cardiovascular health, inhibition of angiotensin-converting enzyme (ACE inhibition) can normalize/lower blood pressure. The (**hydrolyzed**) **dairy protein-derived lactotripeptides** (particularly Ile-Pro-Pro and Val-Pro-Pro)(1320) have this action(1321, 1322) and **taurine** has demonstrated this effect in rats made hypertensive by the anabolic androgenic steroid nandrolone decanoate(1132). Additionally, the effect of ACE inhibition (or angiotensin receptor blockage) may be renoprotective

in and of itself, independent of blood pressure lowering effects(1381, 1382).

- **A number of herbs may reduce blood pressure.** *Rauwolfia serpentina* (of Indian origin) has long been known to have a robu (1361) hypotensive effect(1383, 1384), but may not protect against cardiovascular disease (even in conjunction with a diuretic)(1383, 1384). **The herbs and foods listed below may lower blood pressure**, through a variety of (sometimes unknown) mechanisms(1361):

Table 15: Herbs & Foods that May Lower Blood Pressure(1361).

Ajwain	Flaxseed	Osbeck
<i>Avena sativa</i> (Oats)	French lavender	Pima cotton
Basil	Garlic	Pomegranate
Black Beans	Giant dodder	Prickly Custard Apple
Black Mangrove	Ginger	Pueraria lobata (Kudzu)
Black Plum	Guan Mu Tong	Radish
Breadfruit	Hardy Fuchsia	<i>Rauwolfia serpentina</i> (<i>Rauwolfia</i>; see above)
<i>Camillia sinensis</i> (Tea)	Harmal	<i>Rhaptopetalum coriaceum</i> (Oliver)
Carrot	<i>Hibiscus sabdariffa</i> (Roselle)	Sesame
Cat's Claw	Indian plantago	Soybeans
Celery	Lasaf	Sticky Nightshade/Wild Tomato
Chaksu	<i>Lepidium latifolium</i> (Stone breaker).	Swamp lily
Chinese hawthorne	Maritime Pine	<i>Theobroma cacao</i> (Cocoa)
Coffee weed	Mistletoe	Tomato
Coleus forskohlii (Karpurvali)	Murungai	Virginia dayflower
Cork wood	Nela nelli	Wheat bran

- As one might expect, herbs that reduce inflammation and/or oxidative stress can help ameliorate renal disease. This has been demonstrated for **curcumin** (turmeric) in patients who already have renal disease (1385, 1386) (covered in the Subsection above on **cardiovascular supplements**) and an herb used in indigenous medicine in India called **Arjuna** (*Terminalia arjuna*) which has cardiovascular and hepatoprotective effects via it's antiinflammatory and antioxidative stress activities(1387). **Arjuna's** ability to upregulate tissue free radical quenching capacity manifests strongly in the kidneys of lab rats(1388-1390) and therefore may protect against renal toxicity, e.g., from carbon

tetrachloride(1391).

Astragalus (*Astragalus membranaceus*) is an herb (Huang Qi) used in Traditional Chinese Medicine TCM) for treating edema [among other things(855)]. Astragalus has been integrated into Western medicine to treat nephrotic syndrome (1392), CKD(1393) and glomerulonephritis (1394). Most studies have administered Astragalus via injection or a cooked decoction(1393) [as is common in TCM(1395)]. Large (15g/day) oral doses have proven effective in a patient unresponsive to Western medicine (1392, 1396, 1397), and just 2.5g of Astragalus, twice daily, reversed or stabilized the decline in glomerular filtration rate in all but the most compromised late-stage CKD patients (1398). Interestingly the **active renoprotective agent(s)** in astragalus is not entirely clear(1399). A very large oral dose of aqueous astragalus extract (0.3mg/kg or 30g in a 100kg bodybuilder) causes diuresis by elevating and increasing sensitivity to atrial natriuretic hormone (ANP; see Section 4.8), but this effect seems unrelated to the elevation in Astragaloside IV(1400), considered astragalus' main(1401) constituent(1401), due to its antiinflammatory, antioxidant, anti-viral, cardio-and hepatoprotective, and immune-enhancing properties(1401).

Supplement Stacking, Timing & Hormesis: The Devil's in the Dose Timing

Many of the potentially protective supplements for the **cardiovascular system** or **liver** mentioned above quench free radical stress and/or reduce inflammation and thus may have **overlapping biochemical effects**, or interact with different supplements or drugs(331, 1402), which suggests that shotgunning all of them may be overkill or downright dangerous. For instance, both red yeast rice and citrus bergamot have statin like action, and several of the above-named supplements have antioxidant properties via NRF-2 activation (769).

As I mention above, while substances that upregulate cellular antioxidant responses may be safer in this regard, it's become clear that megadosing vitamins or supplements that **overtly quench free radicals**, e.g., using (daily) doses of 1000mg of Vitamin C and 400IU of Vitamin E(694), can **blunt exercise training adaptations** that rely upon the stimulus of a "hormetic" free radical stress(693, 697, 1403, 1404). Similarly, a large daily dose of 1-2g of **N-acetylcysteine** (NAC) may reduce inflammation(1405) and soreness(1406) initially, but blunt the adaptive molecular signaling brought on by muscle loading(1405), including the processes underlying the protective "repeated bout effect." In the case of NAC, this can translate into

soreness down the road(1406), when soreness would otherwise be reduced as part of the normal adaptation to training(343, 1407) (suggesting that NAC might be impairing training adaptations).

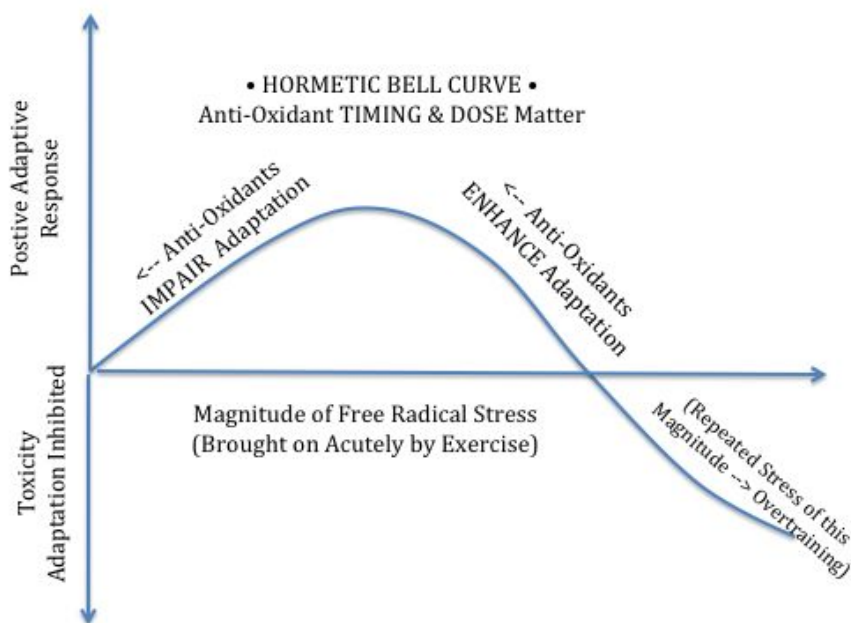


Figure 13: Hormetic Bell Curve in the context of free radical stress and antioxidant supplementation(697, 1408).

Hormetic stimuli (or “insults”), such as free radical stress, present an inverted U (“bell shaped”) kind of dose-response curve: **Adaptation occurs in response to a lower/minimal amount of stimulation** (which would be minimized by antioxidant supplementation, for instance), and **higher doses** can inhibit adaptation or be **toxic**(1403, 1408, 1409), while there is some optimal level in between (see Figure above). One study of young (~26yr old) men and women found that 1000mg Vitamin C/400IU Vitamin E **clearly attenuated acute adaptive responses** to a single resistance exercise bout, but this supplement regimen failed to hamper long-term (10wk) muscle growth, and only had minor effects on strength gain (1410). On the other hand, older folks are more vulnerable to oxidative stress (1411), and the same Vitamin C/E combination actually increased muscle growth in another study(1412), perhaps by optimizing free radical stress.

Additionally, the timing of an antioxidant dose relative to your training session may very likely determine the extent to which the supplement impacts (positively or negatively) free-radical dependent adaptive mechanisms (697). Unfortunately, while it's clear that exercise intensity dictates reactive oxygen species production(1413),

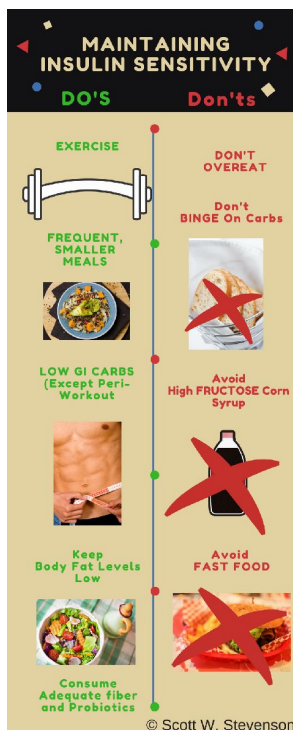
the time course of the various free radical species during postexercise recovery is poorly understood(697), making it challenging to craft recommendations to minimize antioxidant supplement interference with any temporal precision. Just in considering the pharmacokinetics of several of the supplements discussed in this Subsection, one can see that supplement timing to avoid the immediate postexercise period could become quite complicated. For instance, Vitamin C (1000mg) produces elevated blood levels lasting for about 10-15 hr after administration (1414, 1415), whereas 600IU doses of alpha-tocopherol (vitamin E) **peaks** ~12-14 hours post-administration(1416), and blood levels of N-acetylcysteine are only elevated for about 4hr after consumption, depending somewhat on formulation(1417).

It seems then, that until research and/or empirical evidence can iron out the pitfalls (or advantages) that may come from the multitude of potential interactions between training adaptations and the various combinations of antioxidant supplements, those who choose (or feel compelled) to use such substances (in various combinations) may have to accept a somewhat unknown tradeoff between potential health benefits and training gains.

3.7 Maintaining Insulin Sensitivity with Diet, Supplementation and Nutrients

Insulin sensitivity is an oft-bantered term in bodybuilding circles. Greater muscle insulin sensitivity is a hallmark of the postexercise period(73, 561) when myofiber remodeling (in our case muscle growth ideally) is taking place(1418), whereas poor insulin sensitivity is associated with obesity(1419, 1420). Firstly, here are some important things to keep in mind regarding insulin sensitivity before investigating its role in bodybuilding:

- **Insulin sensitivity exists along a continuum**, where it is inversely related to body fat, with the worst scenarios manifesting as increased abdominal (trunk) fat (e.g., when there is a large ratio of waist:hip circumference) (1421-1423) and the associated symptoms of cardiovascular disease, hypertension, dyslipidemia, etc (1181).
- **Carbohydrate consumption *per se*** does not seem to cause overt insulin insensitivity(1424), but if you're eating a high carbohydrate diet, **insulin sensitivity is improved by eating low glycemic index foods**(1425). The exception here as far as carbohydrate intake is **fructose**(1426), e.g., in processed food containing high fructose corn syrup. It's possible that replacing carbohydrate with unsaturated fat can improve insulin sensitivity as well(1427).
- Additionally, eating regular, **frequent meals** does favor insulin sensitivity(1428, 1429), and, as you might have guessed, **fast food** consumption is not in your favor(1430).



On the other hand, **simply overeating will reduce insulin sensitivity**(1431), which makes physiological sense. The situation is not so grim that a single large carbohydrate meal puts you into fat accumulation mode(1432), but when (liver and skeletal muscle) glycogen levels are full, fat accumulation (*de novo lipogenesis*) starts in just **couple days**(89), and fat cells begin upregulating their enzymatic capacity for fat storage(1433).

- **Probiotic supplementation**(750) and adequate **fiber** intake(709) both improve insulin sensitivity generally and fiber intake may be important(1434) for the beneficial effects of a healthy microbiome to manifest in a leaner physique(1435). (For more on fiber and the microbiome, see [Section 3.4](#) above.)
- So the point here that eating **excess** carbohydrate on a regular basis can **inhibit fat oxidation** (via insulin release) and thus shift **fat balance** causing body fat gain(1436). [Increasing your protein intake *per se* is less likely to cause this issue(98, 415, 416).] Conversely, elevated blood fatty acids (after eating a high-fat meal for instance) can impair insulin sensitivity and glycogen resynthesis. **Saturated fat** has been

especially associated with insulin resistance(1437). We should keep this in context, though: The insulin-sensitizing effect of exercise is so great that even large amounts of dietary fat do not impair glycogen resynthesis following the first meal or two postexercise (1438-1440).

- In my book **Fortitude Training®**, I present the notion of metabolic flexibility (and dietary approaches based upon it), which refers to the body's ability to adjust fuel **selection** (oxidation of fats vs. carbohydrate) to fuel **availability**(815, 1441). Greater metabolic flexibility means a tendency to oxidize rather than store fuel (as fat). Although the mechanistic connections haven't been wholly elucidated (1441), metabolic flexibility and insulin resistance are intimately intertwined(815, 1442), so greater insulin sensitivity generally favors less storage and more oxidation of fat, which translates into a leaner physique. Studies in mice(1443) and humans(813, 814) suggest that merely shifting carbohydrate intake to later in the day (which means carbohydrate restriction at other times) improves metabolic flexibility (1443), and, when dieting for fat loss, eating more carbohydrates late in the day results more favorable body composition changes (more fat lost and muscle retained)(813), as well as a more desirable blood lipid profile and reduction in whole-body inflammation (814). [This benefit **can't be had** just by eating more at dinner time (1444), however, and eating in the middle of the night/when one would normally be sleeping(1445) might even be worse, as (an undisturbed) **circadian rhythm** may be involved in establishing metabolic flexibility(1443, 1446-1448).]
- In well-designed studies, it clear that (obese) individuals with impaired insulin sensitivity (diabetic and pre-diabetic, with typically high fasting glucose levels and demonstrating impaired insulin action) **do best on a fat loss diet geared towards increasing insulin sensitivity** (i.e., a low carb approach)(540, 1449-1452). Several studies have not found this to be the case, but have used very large caloric deficits (~1000kcal/day)(1453, 1454) or only small (41% vs. 57%) differences in carbohydrate content, while failing to equate protein intake between groups(1455). One

study performed in Colorado found that insulin resistant, obese women lost twice as much weight using a low carb approach, whereas (obese) women who already had good insulin sensitivity fared better on a higher carbohydrate fat loss diet(1449). On the other hand, maintaining insulin sensitivity is a good ideal: When starting a diet, having a high insulin response [indicative of **poor insulin sensitivity**(1456)] can mean **less fat and more muscle lost**, and a more substantial slowing of metabolic rate (1457). As noted in [Section 2.2](#) (and the [FAQ on Metabolic Damage](#)), being insulin sensitive after weight loss (think Post-Contest here) predisposes one to gain body fat, whereas **following a low glycemic load diet can prevent fat regain** after dieting down(1458), and loss of insulin sensitivity predicts weight gain. Similarly, one study found that the typical weight gain and ballooning waistline of modern living is related to loss of insulin sensitivity, but that a higher fat (lower carb) diet slows this creeping obesity and uncouples it from insulin sensitivity(1459).

- In addition to the effects on insulin sensitivity **per se** (and thus metabolic flexibility), authors of the above studies have implicated the interactions of dietary macronutrient content with nonexercise activity thermogenesis (NEAT – see [Chapter 3 Special Section on Cardio in the Off-Season](#))(1449) and dietary fiber’s (prebiotic) effects on the microbiome production of short-chain fatty acids(1451) (See [Section 3.4](#) subsection on fiber intake). Additionally, minor differences in thermogenic effects of carbohydrate (6-8%) vs. fat (2-3%)(357, 421) may play a differential role in the caloric deficit depending upon insulin sensitivity.
- Interestingly, insulin resistance may be a cellular strategy for **preventing oxidative damage** to cells(1460). It seems thus that it would be smart to design a glucose disposal agent (GDA) supplement combo to include R-alpha-lipoic acid, both a GDA and an antioxidant(1137). On the other hand, if you’re thinking about using alpha-lipoic acid “undo” the loss of insulin sensitivity secondary to splurging on overly fatty food, note that alpha-lipoic acid also increases the

insulin sensitivity of **fat cells**(1461), which would tend to increase fat deposition in adipocytes.

Insulin Sensitivity, Muscle Gain, Diet and Exercise

Given the above, why would insulin sensitivity matter to the bodybuilder?... Well, muscle mass can only be gained at some particular rate, depending on the individual (39, 40, 189, 190), whereas body fat storage is, for many, a much easier endeavor(183-185, 347, 1419, 1462). When lean, e.g., during the post-contest period or at the beginning of the Off-Season, it's particularly easy to gain body fat(67-71) which of course means reduced insulin sensitivity (see above). Insulin is quite important for positive protein balance in hypertrophying muscle, in particular when it comes to limiting protein breakdown (404, 405, 565, 1463-1466) and even promoting protein synthesis(563) so maintaining insulin sensitivity while gaining muscle mass is in the bodybuilder's best interest.

Exercise, of course, including resistance exercise(1467) increases insulin sensitivity(1468). This occurs acutely because as muscle contractions have an "insulin-like effect(73)." After resistance exercise, there is a simultaneous increase in myofibrillar protein synthesis and responsiveness to the protein-synthetic effect of incoming essential amino acids(1469). Taken together, maintaining insulin action in skeletal muscle (specifically via resistance training that also promotes muscle growth) is important for maintaining positive protein balance in this tissue we adore so much.

Loss of insulin sensitivity is characterized by elevated muscle triglycerides(1470, 1471), impaired effect of insulin on skeletal muscle blood flow(1472), which is vital for its effect on myofibrillar protein synthesis(563) and a variety of molecular mechanisms(1471, 1473) that impair glucose metabolism and glycogen storage in skeletal muscle(1474). Some scientists suggest that skeletal muscle insulin resistance is the primary defect in type II diabetes(1475), which is strongly associated with obesity(1474, 1476).

So imagine an Off-Season diet gone off the rails... You're eating much more than the food necessary to make consistent gains in muscle (gaining perhaps more than a pound of body weight per week, for instance). You've adopted a "powershoving" strategy (see the **Special Section** at the end of this Chapter). You're opting for meals laden with saturated fat and eating too many desserts loaded with high fructose corn syrup. Because you're chronically elevating insulin and blood fatty acid [not to mention filling liver glycogen rapidly with fructose(1477)], you are driving the accumulation of intramyocellular

fat stores (1471) (triglycerides within muscle cells) and losing insulin sensitivity in skeletal muscle. Despite all the carbs you're pounding down, muscle glycogen levels may even start to wane(1475), making it harder to get a pump in the gym (61) despite using an intra-workout carb-protein drink. It gets worse, however. Insulin's effect on renal sodium handling (1478) may leave you retaining more water than usual(1479), obscuring muscularity, and even elevate your blood pressure a bit(1480). Gradually, you notice it's more than just water retention: You're beginning to gain body fat more rapidly relative to muscle mass than in previous weeks (your gains are "dirty" so to speak). The thrill is gone: Gains are predominantly fat, and training isn't nearly as fun [and possibly not even as effective (61)] without at least getting a good pump.

All Off-Season gaining is hopefully not lost, however , unless you have gone completely off the rails and gained substantial body fat. **See Section 1.3 Example Goal #1** for more on acceptable body fat. [Some competitors have at one time or another experienced the worst-case scenario of loss of insulin sensitivity described above during the Post-Contest period, reversing months of dieting in a matter of weeks. In this case, or if you have gained more body fat that is acceptable during your Off-Season, a prolonged (3+ week) fat loss diet might be in order.] As indicated above, one can restore insulin sensitivity by reducing carbohydrate and caloric intake, eating smaller more frequent meals, and perhaps even by replacing saturated with unsaturated dietary fat (1427, 1437, 1481, 1482) and ensuring adequate polyunsaturated fat intake(1483). Keeping to a regular daily schedule(1484) where you are to get enough sleep(1485-1487), and (also related to your circadian rhythms) making certain your Vitamin D status is in check are also vital for good insulin sensitivity(1488, 1489). Lastly, in fine-tuning your approach, note that there is **some variability in the association between insulin responses and insulin sensitivity**(1490), and large variability in the glycemic responses to different foods and meals(180-182). This suggests that choosing the right food and diet for you is important for maintaining insulin sensitivity: Measuring your own glycemic responses to food (with a glucometer) could prove insightful.

Glucose Disposal Agents: A Multi-Edged Sword

The topic of glucose disposal agents (GDAs) often comes up in the context of insulin sensitivity, for use to improve insulin action, reversing insulin insensitivity or improve the "disposal" of glucose (i.e., removal from the blood and uptake ideally by skeletal muscle tissue), typically with the goal of (re)storing glycogen. Ideally, for our

purposes, a GDA would somewhat selectively promote these actions in skeletal muscle rather than adipose tissue(e.g., by enhancing glucose transporter activity, intracellular glucose handling, having antioxidant activity (see above), etc.], thus reducing insulin release. For the purposes of insulin sensitization, slowing entry of glucose into the blood (gastric emptying) might be useful in pathological conditions such as diabetes and Pre-Contest (when food intake is low), but less so in the Off-Season when reducing gastric fullness could be the goal.

Some GDA's are known to be activators of adenosine monophosphate kinase (AMPK), mimicking the effect of aerobic exercise (cardio) on energy status. AMPK activation signals increased energy demand, and concomitantly shuts off mTORC1, a central player in initiating protein synthesis(66, 1491-1493), meaning they may the hypertrophy process (which I'll address again at the end of this subsection). Several drugs have been employed in bodybuilding circles that have this AMPK-activating effect, such as AICAR (an AMP analog) (1494-1496), metformin(1497-1499) and GW1516(1494, 1500-1503), but I'll not cover those specific compounds here (except metformin – see below). Instead, I'd like to bring your attention to a few OTC insulin-sensitizing "GDAs" some of which you likely know of:

- I've covered **curcumin** already (Section 3.6 above) the context of cardiovascular health, but it also has modest insulin-sensitizing effects, by activating AMPK.(1255, 1504). Despite this mechanism, curcumin seems to be a safe bet when it comes to gaining/retaining muscle mass, By limiting protein catabolism, it can prevent atrophy during extremely catabolic situations(1505, 1506), but not where there is extreme disuse (1507) (e.g., when bedridden). Perhaps also by tempering protein breakdown(1257), curcumin can help in **regaining muscle** mass during abrupt (re-)loading or after traumatic injury(1259) or inactivity(1258).
- **Berberine**, which I've also covered in Section 3.6 above in the context of its potential cardiovascular benefits activates AMPK (1277-1279), in part by impairing mitochondrial energy production(1285, 1286), and has glucose lowering effects(1279) and other metabolic effects (including mTOR enzyme complex inhibition) on par with metformin (Glucophage) (1277).
- **Alpha-lipoic acid** (also covered in Section 3.6 as a hepatoprotectant) is an AMPK activator, thus increasing insulin action in skeletal muscle(1134) and reducing insulin secretion(1508), which increases energy

expenditure and mitochondrial biogenesis (1135). Because it is both an antioxidant and inducer of cellular free radical scavenging ability(769), it can also prevent oxidative damage associated loss of insulin-sensitivity(1460). Unfortunately, acute ALA consumption might reduce appetite(1136) and **chronic use could promote muscle wasting** (1135).

- **Chromium** increases AMPK and counteracts insulin resistance(1509) and has a small effect on fat loss(1510), although one study found no effect on rates of postexercise glycogen synthesis(1511). Similarly, most of the early research (often with low doses) does not support any effect on body composition(692). Still, it seems **that the type of chromium** presented to the muscle cell (e.g., if chelated with small peptides) may boost the amplification of insulin signaling(1512) and recent research even suggests that chromium can improve the anabolic response to a small protein dose(1513), so there may still be hope for this supplement as a GDA and insulin sensitizer.
- **Cinnamon extract** contains polyphenols that have potent antioxidant (707), antiinflammatory(1514) and insulin-like(1515-1517) actions, and chronic supplementation reliably lowers fasting blood glucose(1518). **Two weeks of chronic supplementation** has a persistent effect in improving glucose tolerance after(1519), whereas taking a single dose may not help with macronutrient handling(1520).
- **Fenugreek** (*Trigonella foenum-graecum*) is a legume and spice that contains 4-OH-Isoleucine(1521), which potentiates insulin release in response to hyperglycemia in particular(1522) and activates AMPK, stimulating mitochondrial biogenesis(1523, 1524). Fenugreek also contains an alkaloid that seems to improve insulin sensitivity and pancreatic β -cell regeneration (1525), and **(dramatically) improves hyperlipidemia** in Type II diabetes patients(1526). Following up on research suggesting fenugreek has is anabolic (but not androgenic) activity in rats(1527), a fenugreek supplement failed to enhance muscle gains during resistance training, although it did **promote fat loss**(1528), which confirms other studies using obese rats (1529).

There are many other potential GDAs on the market, such as vanadyl sulfate, which has some glucose disposal actions but is not well researched (1530, 1531). [Don't forget, too, that food can be a weapon in improving insulin sensitivity: Blueberries, for instance, are a functional food that, likely due to their anthocyanin content(1532), has insulin-sensitizing (1533) actions, as do many other fruits, vegetables and other foods with bioactive ingredients(1534).] So, buyer beware: The GDA product category will probably forever hold allure. Anecdotally, I've found that the "Ultimate Glucose Disposal Agent" produced by Truenutrition.com for John Meadows (and formulated by Dr. Bill Willis) works well for peak week carb-loading (see [Section 4.8](#)).

A **common question** that seems to originate in experiences of those using metformin, a powerful AMPK-activating glucose disposal agent, is whether GDA's that share this effect could impair **muscle growth** (as some but not all metformin users have reported). By handicapping cellular energy balance, impairing mitochondrial function and inhibiting protein synthesis, such GDAs could limit muscle growth via similar mechanisms (1287-1290) involved in the interference in muscle and strength gains caused by concurrent endurance exercise training(1291). The sizeable biological interindividuality in training adaptations (1535) predicts the finding that the extent of this interference is highly variable(1536), one that I, and likely you, have observed over the years. (Some people get away with a lot of cardio without negatively impacting muscle size, and others just can't.) Similarly, the "word on the street" suggests that the extent to which different AMPK-activating substances impact the hypertrophy process also varies. When asked this question, I usually adopt a common sense, where does the "rubber meets the road" perspective: For those who find **gaining muscle to be more difficult, it makes sense to be more cautious with GDA use**. On the other hand, those who **gain body fat** more easily (and are thus likely less insulin sensitive), but also **put on muscle relatively** well, might consider GDAs in the off-season to keep body fat in check.

Note too, that the interactions of AMPK activation, mTOR inhibition and their relation to muscle growth can be very complex as unique for each GDA (see above). I leave you with some information about **metformin, as an example**, mainly because it's because it's so well studied (and possibly an option some of you reading might consider):

- AMPK is composed of three subunits (alpha, beta and gamma), each having two possible isoforms(1537, 1538). It seems that the alpha-1 subunit-containing AMPK, the subunit activated by resistance

exercise(1539), in particular, is involved with muscle growth, specifically by slowing hypertrophy when activated (1540) [However, this latter effect was demonstrated in mutant mice lacking alpha1-containing AMPK(1540), which also confers an undesirable inability in skeletal muscle to regenerate properly after an inflammatory insult (1541).] Metformin, on the other hand, is known to activate the alpha2 containing AMPK, but not the alpha1-AMPK(1542), which, in and of itself, would suggest metformin might not negatively impact muscle growth.

- The plot thickens: Metformin interacts with AMPK in ways other than via the alpha subunit(1543-1545) and also inhibits mTOR independent of effects on AMPK(1546, 1547). Metformin may also increase myostatin(1498), which would put the brakes on muscle growth (191, 377, 1548, 1549).
- **Training study data** examining the impact of metformin on muscle growth are **sparse**, to say the least. A study of HIV-infected patients found a positive difference in thigh muscle CSA when resistance training was added to a metformin treatment protocol (3 months), but the **median increase** in muscle size was only 1.9% (compared to a 2.3% **loss** in the group not training)(1550). A study of older adults is underway at the time of this writing (due to finish in 2019) based on the premise that metformin might rectify excessive inflammation that limits muscle growth, especially in non-responders(1551). This idea has precedence in the literature, where cyclooxygenase inhibitors [which typically reduce resistance exercise adaptive responses(1552, 1553-1555) and possibly(1552, 1556) hamper hypertrophic adaptations in higher(1557), but not lower doses(1558)] have been shown to **enhance recovery** from an extremely damaging contractile bout(1559) and increase resistance-training induced muscle growth in the aged(1560, 1561), possibly by optimizing the hormetic stress of resistance exercise(1403, 1408, 1409) in the aged. (For more on hormetic stress, see “Supplement Stacking” at the end of **Section 3.6** above.) Similarly, because the elderly may be susceptible to free radical stress, a Vitamin C/E combination that could impair adaptations in the

young(693, 697, 1404, 1410) may optimize free radical stress in the aged(1412, 1562). (I'm crossing my fingers, but not holding my breath, and hoping a team of scientists might also find value in investigating whether metformin affects muscle growth in young, previously resistance training subjects.)

3.8 Peri-Workout Recovery Supplementation

If there is perhaps one bodybuilding strategy that I am known to be in favor of, when **appropriate**, it's the use of a peri-workout (pre-, intra-, and/or post-workout) recovery supplement (RS), more commonly loosely referred to as an “intra-workout” recovery drink. I've covered the science behind topic extensively, both in articles founds at [EliteFTS™](#), and in my book [Fortitude Training®](#).

I was first introduced to the notions of peri-workout RS in the 90's, via the works of Thomas Fahey([1563](#), [1564](#)). IFBB Pro bodybuilder Milos "the Mind" Sarcev was instrumental in popularizing intra-workout drinks in the bodybuilding community around this time as well. However the scientific community is somewhat polarized on this notion of nutrient timing, ranging from experts strongly in favor ([1565](#)), including a position stand of the International Society of Sport Nutrition([1566](#)), to others much less supportive of peri-workout RS and a protein-based nutrient timing strategy for gaining muscle mass([1567](#), [1568](#)).

Why use a PeriWorkout Recovery Supplement?

Here's the short n' sweet of my take on the rationale for using a peri-workout RS containing both protein and carbohydrate:

- The purpose of a peri-workout RS (nutrient timing) strategy is to **match dietary intake with the insult of training**, specifically in a temporal sense, to offset energy demands and initiate recovery as soon as possible.
- **Glycogen is replenished** expediently([582](#), [1569](#)) when carbohydrate intake is timed close to the exercise bout.
- **Muscle protein synthesis is further stimulated** when protein is added peri-workout([26](#), [383](#), [1570](#), [1571](#)) and this may pay off over the long haul([1572](#), [1573](#)).
- In using a peri-workout, RS, **myofibrillar protein breakdown inhibited**([1574](#)) and muscle damage limited([1575](#)), thus promoting more positive protein balance, and this may be even more so the case in the trained individuals([1576](#)) compared to those who are novices when it comes to weight training.
- A peri-workout RS **reduces cortisol** [in particular via RS carbohydrate([1577-1579](#))] which may lead to **greater**

gains in muscle size(154, 155, 1580) and **strength**(1581).

From a practical standpoint, it's important to note here when considering **timing** that "**intra-workout**" for a given training session is actually "**post**" workout for the muscle groups trained early on. For example, if back, biceps and calves were trained sequentially, the "back workout" is essentially over long before the training session has ended, so an intra-workout RS ensures that there is no delay in initiating the above recovery processes [which could be vital for making **gains**(1582)] by instead waiting until the workout has ended to consume the "post-workout" recovery nutrients.

The Rubber Meets the Research Road

How **well** does peri-workout nutrient timing work (if and when it does)? In examining the research on this topic, it's important to note that, while it's logical to assume that the **acute** effects on myofibrillar (muscle contractile) protein synthesis (MPS; see above) should accumulate over the course of training (workout after workout), summing to produce muscle hypertrophy, it seems that postexercise measures of protein synthesis(186) and anabolic signaling(187) made **at the very start** of a training period **do not actually predict gains** in muscle size over the course of training. Instead, only after the first few training session, when muscle soreness and indices of damage have subsided, is MPS predictive of ultimate hypertrophy (188), likely because MPS at the onset of a new training program reflect "damage control" as opposed to hypertrophic accumulation of new contractile protein(192, 1583). Thus, the results of **many short-term studies may have limited applicability to training gains**. Additionally, the majority of training studies (19 of 23 studies included in a recent meta-analysis) examining protein timing involved previously untrained individuals (396). [As you might expect, however, and as previously shown(395), increased protein positively affects muscle growth, generally speaking(396).] So, the research in this area is relatively thin when it comes to what we can apply directly to hard-training, experienced, high-level bodybuilders.



WHY USE A



PERI-WORKOUT

RECOVERY SUPPLEMENT (RS)

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NUTRIENT TIMING

Couple Nutrients with time
that recovery is most
demanding

GLYCOGEN RESTORATION

Most rapid post-
exercise



PROTEIN SYNTHESIS



Dietary protein amplifies
protein synthetic effect
of training

INHIBIT BREAKDOWN

Insulin & protein inhibit
protein breakdown, favoring
overall anabolism



REDUCE CORTISOL

Carbs lower cortisol
levels, which predicts
training gains



On the other hand, there are data where dietary intake was well controlled for, i.e., only peri-workout RS **timing** varied (without impacting caloric and/or macronutrient intake) that have shown greater muscle gains in trained(1584) and untrained subjects(1585). There are also training data showing the muscle gains are enhanced by adding both protein (as essential amino acids) and carbohydrate

peri-workout, and that the combination thereof has a superior effect(154).

PeriWorkout RS: When and What

A peri-workout RS is, if nothing else, a great way to kill two birds with one stone by having a “meal” while training, which can be helpful when Off-Season calories are high. On the other hand, consuming even very small amounts of essential amino acids(1586) and carbohydrate(155, 1587), such that they are bloodborne during or immediately after exercise can be metabolically beneficial. Here are some ways to make use of a peri-workout RS:

- When dieting to lose body fat, even a calorically small (6g of essential amino acids + 35g carbohydrate) peri-workout RS will be helpful for enhancing protein synthesis(1586, 1587) and training gains(154).
- For bodybuilders who train in the morning (e.g., before work when time is limited) making your peri-workout RS your "breakfast" is a time-saving strategy that makes sense especially because protein balance is negative after an overnight fast (377).
- If eating enough to gain weight (muscle) is an issue, peri-workout RS is a multitasking strategy that I have found to be an effective way to consume more nutrients during the day.

Here’s an example of how one might structure a day’s meals to fit in a peri-workout RS that increases overall caloric intake. (See section below for more on the pre-training meal.)

Meal	Time	No RS	With RS
Meal 1	7AM	700 kcal (lower carb)	700 kcal (lower carb)
Meal 2	10AM	700 kcal (lower carb)	700 kcal (lower carb)
Meal 3	1PM	700 kcal (mixed macros)	800 kcal (mixed Macros)
Meal 4	4PM	700 kcal (mixed macros)	500 kcal (50g Pro, 75g carb)
Peri-WO RS	5:30PM	NOTHING	500 kcal (50g Pro, 75g carb)
Meal 5	7PM	800kcal (higher carb)	800kcal (higher carb)
Meal 6	10PM	800kcal (higher carb)	800kcal (higher carb)
Totals		4200kcal	4800kcal

Table 16: Example of Dietary Restructuring to include PeriWorkout Recovery Supplementation

The basic constituents of a peri-workout RS need not be complicated: Protein and carbohydrate, plus perhaps a few “bells n’ whistles” ingredients are all that’s needed. In general, increasing the

size of this “meal” during your Off-Season is a great Primary Strategy for fostering muscle growth (see [Section 3.3](#)), as well as one of the most important meals to retain (as long as possible) when dieting down Pre-Contest (see [Section 4.3](#)). **In other words, this is a great place to start adding nutrients when gaining and the last “meal” to sacrifice when reducing caloric intake to facilitate fat loss.**

PeriWorkout RS Protein, Essential amino acids (EAAs) and Di-and Tripeptides

Protein is probably the most important of the ingredients([1568](#)) in your recovery supplement, especially the essential amino acids [with L-leucine being most important([1588](#))] due to its primary role in directing protein synthesis([373](#)). The EAAs stimulate insulin release([1589](#), [1590](#)), which in turn is anti-catabolic([1591](#)) which mediates muscle protein synthesis by increasing blood flow([563](#)). [In fact, a 30g **blend of all of the EAAs** is more **insulinotropic** than 30g of glucose or any of many other combined mixtures of the EAAs([1592](#)).]

Additionally, **hydrolyzed proteins** rapidly elevate blood di- and tripeptide([828](#), [832](#), [833](#)) and insulin levels([817](#), [819-822](#)) **more rapidly** than intact protein, and **enhance glycogen synthesis**, irrespective of (elevated) insulin([824](#)), and may even **promote fat loss** in a way that intact whey does not([835](#)). Di- and tripeptides([817](#), [1593](#)) that are **rapidly absorbed**([1594](#)) via a specific intestinal transporter([832](#)) and may have an **additive effect** in increasing postexercise protein synthesis([827](#)). (For more on **combining hydrolyzed and intact protein** sources for **rapid absorption of all the EAAs**([817](#), [818](#), [823](#), [828-833](#)), see the discussion of protein nutrient timing in [Section 3.5](#) above.) It's important to have an easily assimilated (for you!) EAA-rich protein [like **whey**([439](#)), egg([1595](#)), or beef([364](#), [427](#), [1596](#), [1597](#)), all available powder form]. Including an ample total amount of protein to sustain protein synthesis is vital, too([383](#)). Somewhere between 20 grams([362](#)) and 40 grams([365](#), [366](#)) of protein may be needed to optimize protein synthesis postexercise, but the body size (and muscle mass) and/or the training volume per workout of many of you reading this may mean that 20g of protein is not enough([1598](#)).

Thus, I favor higher amounts of protein (e.g., 50+g of whey isolate in a 250lb bodybuilder) in your peri-workout shake if you're training longer than an hour, in particular, because these more substantial amounts may favor greater positive protein balance by reducing protein breakdown ([404](#)). Thus, for digestive reasons (among others – see above) it may be to your advantage when consuming large(r) amounts of protein your peri-workout RS to use (at

least in part) a **hydrolyzed protein source**. On the other hand, adding in **EAA**(383, 1599) or leucine(1600) to your RS makes metabolic sense if your RS only contains a **suboptimal** amount (<40g) of a whole protein source(1601).

PeriWorkout RS Carbohydrate

It's clear that peri-workout carbohydrate taken alone (without protein) can **improve protein balance**(1602) [although it may still be negative(834)], as well as **foster gains in muscle mass**(155). On the other hand, a recent review(1603) focusing on acute postexercise protein synthesis concluded that adding carbohydrate offered “no further beneficial actions.” Recall, though, as I noted above, that postexercise MPS does not necessarily relate to muscle growth over the long haul(186, 188, 192, 1583). Still, those reviewers and others(1604) note the value of postexercise carbohydrate intake for glycogen restoration between workouts, especially if the recovery period is short(909). Indeed, combining protein together with carbohydrate synergizes insulin release and it's metabolic actions, e.g., glycogen synthesis(1605). A combined protein/carbohydrate supplement reduces cortisol(155, 1579) and muscle damage due to exercise(1575), and adding carbohydrate to EAA's furthers this damage-minimizing effect(1574).

One study of **intra-workout protein** found that combining protein (at a dose equivalent to 30g consumed during a 2hr workout for a hypothetical 220lb bodybuilder) alongside an equivalent amount of carbohydrate reversed the negative protein balance found when only carbohydrate was provided(834). Most importantly, over the long haul, the combination of EAAs and carbohydrate in an intra-workout RS has been shown superior to merely consuming EAAs or carbohydrate alone for muscle growth (154).



Peri-Workout Recovery Supplementation Basics

PROTEIN: 6g EAA - 50+g
Whole, Leu-Rich Protein
(possibly with protease)

CARBS: Easily Digested /
Absorbed 20-50+g. (+ Kc
here)

BELLS n' WHISTLES

- Ergogenic aids
- Contraction aids up to
- Electrolytes & Plenty of
- Restoratives (e.g., adaptogens)

...AVOID...

- Poorly Absorbed
- Antioxidant Megadoses

So, while the data are sparse(1603) and lacking in highly trained subjects(1604) as far as the impact of carbohydrate on muscle hypertrophy, my experiences as a coach and athlete, it's practical value for glycogen restoration and ergogenesis while training(550, 554, 680, 681) and simply as an easy and convenient way to increase carbohydrate intake during the Off-Season, make it a worthwhile effort. [If you're not using a peri-workout RS in some form, and doing so doesn't negatively affect your workouts, digestion or run counter to a personal "anti-supplement stance" or directive to consume as much (non-supplement) food as possible, you might ask yourself, "Why you would not at least try out such a potentially anabolic strategy ... for at least a month or two?..."]

Pre-workout Fat and When to Consume your PeriWorkout RS

One approach (favored by my friend IFBB Pro John Meadows, for instance) favors including a small(er) meal (~30-90min) pre-training that has a small amount (~20g) of fat to slow gastric emptying(516, 1606) thus ensuring stable blood glucose levels during

exercise. This can also be accomplished simply by metering one's consumption of the peri-workout during the course of the workout, which is what I typically suggest. Both strategies can be effective and personal preference may dictate whether you'd rather start your workout after a pre-training meal or ensure nutrient delivery during your workout sipping on your peri-workout RS a few (~15) minutes before you begin exercising.

Bells n' Whistles (Other Ingredients)

For decades, the "kitchen sink" approach has been a selling point in the bodybuilding supplement market: The more "bells and whistle" ingredients a product has (typically contained within as a proprietary blend, thus obscuring the actual amounts of a given compound), the greater the selling power. Obviously, a supplement containing 20 different ingredients is better than one that has only 10, right? Well, when it comes to a peri-workout recovery supplement, this may not be true. Here are some general Dos and Don'ts when it comes to "supplementing" your peri-workout RS if you choose to create your own RS from basic ingredients.

PeriWorkout Recovery Supplement DON'Ts

- Add ingredients unnecessarily, i.e., that you could easily consume at other times of the day.
- Add ingredients that can cause gastric distress or other issues when exercising.
- Think twice before adding ingredients that a poorly absorbed in general (e.g.. ursolic acid(1607, 1608) or some curcumin products(1260, 1261)).

PeriWorkout Recovery Supplement DOs

- Consume supplements like L-carnitine(996, 998, 1002, 1609) or creatine, that are potentially **ergogenic**(1000, 1001), **better taken up during exercise**/as a result of contraction(1610) and/or in combination with carbohydrate(996, 1001), favor restoration of glycogen(1000, 1001) and/or are intrinsically anabolic(927).
- Consume supplements that are **generally restorative**, such as a multi-vitamin/greens formula and/or adaptogens, although beware megadosing of antioxidants, which can limit training adaptations(694,

1611).

- Include supplements that may help with **hydration** and **electrolyte** balance (and cramping), such as an electrolyte powder, glycerol(1612, 1613) and/or taurine(1125).
- In (Pre-Contest) scenarios such as when carbohydrate intake is limited and/or rapid glycogen replenishment on a premium, consider including a glucose disposal agent (See Section 3.7) such as John's MD Ultimate Glucose Disposal Agent (available at www.TrueNutrition.com). Your mileage may vary here, as, in these situations, insulin sensitivity may already be so high that a GDA won't help.
- Use **carbohydrate** sources that are easy for you to **digest**, such as highly branched cyclic dextrins(588, 589) [which may also have ergogenic effects(1614)].
- To help with **protein assimilation**, consider adding a (proteolytic) digestive enzyme to help break down protein(1311) and/or using a hydrolyzed protein source(818, 835, 1615).

3.9 Off-Season Training Regimens: Picking and Rotating Your Poison

You might be thinking if you've read the entire book up to this point, "Scott, where is the training information?... Bodybuilding is about training at its core, right?..." You make an excellent point and one near and dear to my heart, which is why I spent about 40 pages covering various aspects of the science underlying resistance training to induce muscle growth in my book [Fortitude Training®](#).

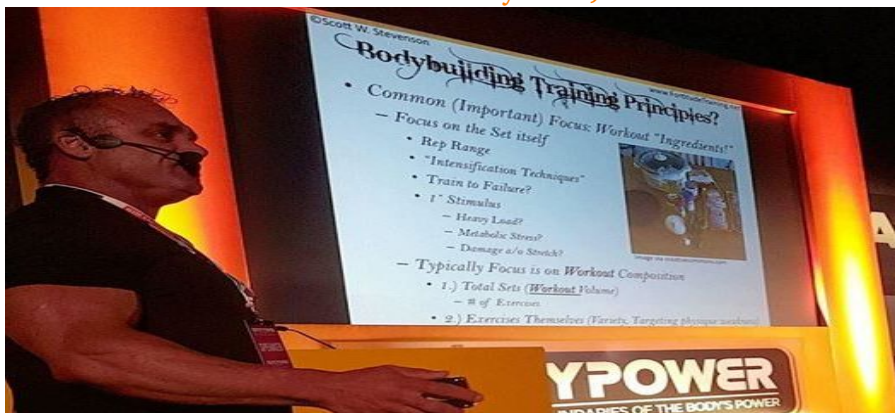
Rather than rehash all of that here (be on the lookout for a second edition of the FT book), I'll give you a summary here instead. Truth be told, there is a **multitude of training regimes** that can get the job done when it comes to packing on **muscle size**, but one must recognize biological interindividuality([91](#), [1616](#)) and find the program that works best for you. Fortunately, there is essentially an endless number of potential ways to configure the aspects of training that will prompt muscle growth. Here are the most important of the **training principles**, in my opinion (with a little substantiation by exercise science):

- **Training frequency** (workouts/week; workouts/muscle group/week)([1617](#)). **Training a muscle group 2-3x/week** seems optimal([29-33](#)) for adding muscle size, although studies examining training thrice or more often per week are lacking. [This falls in line well with meta-analyses examining frequency of training to gain muscle strength([1618](#), [1619](#)), which goes hand in hand with gaining muscle size.] On the other hand, many competitive bodybuilders in the world train a muscle group only once every 5-7 days([160](#)).
- **Training volume** (Sets or Sets x reps) or **Workload** (Sets x Reps x Load). Training volume must be adequate in the context of recovery, as there is a dose-response relationship between training volume and muscle growth ([63](#), [64](#), [1620-1622](#)).
- **Progressive Overload**, in terms of Loads used, repetitions performed, and/or training Volume/Workload over the course of a training period)([1](#), [1623](#)). It seems that strength gains, although variable just like gains in muscle size, are important predictors of gains of muscle mass, especially the more trained (experienced) one is([1624-1628](#)).

- **Variety and sequencing** of exercises(1629), which may be important for ensuring full muscular development across muscle bellies(1630, 1631), i.e., complete muscular development.
- **Variety in Set Types** (high reps, low reps, cluster sets, etc.), e.g., as a daily undulating periodization (DUP) scheme(51, 53, 55, 1632). [I have found with those who use Fortitude Training® that this aspect of a training regime is quite fun and keeps motivation high, which I can't help but think improves adherence(1633) and performance(1634).]
- Inclusion of “**intensification**” techniques (drop sets, forced reps, etc.) and variation of rest intervals(1635)
- Employing some sort of **auto-regulatory** (“instinctive”) features in the program design(51, 146, 1636), such as load selection and choice.
- Some sort of **periodization** scheme that includes a deload/taper(1617).

A QUICK WORD ABOUT PREFERRED TRAINING SYSTEMS

Of course, I've got my preferred training regimes, with my own **Fortitude Training®** being at the top of the list. There are a couple others as well that I'm familiar with, because of personal experience and/or my interaction with their developers (John Meadows and Dante Trudel) and experience in seeing the programs work (often first hand with clients who have used the systems).



- **Fortitude Training®** (FT; by yours truly): Fortitude Training® is a training system, including a dietary and nutritional supplementation approach, a template so to

speaking, strategically coupled to a rigorous resistance training program. I've included each of the aspects noted above in the overall design of FT, in a structure that can be tailored to focus on gaining muscle mass (its primary utility) or losing fat, in the context of biochemical interindividuality (the idea that "we're all a bit different"). The stress of training (frequency, volume, periodization scheme) and dietary and supplementation approach can be modified as needed. The Fortitude Training book simply puts forth **my best suggestions**, which naturally should be integrated with your own training experiences and know-how. Fortitude Training® is available as an e-book here: <http://www.fortitudetraining.net>. When you purchase FT, you receive a free lifetime subscription to **my forum** at www.integrativebodybuilding.com as well, where I answer questions daily (and have been doing so for years now, leaving a large repository of Q and A for those interested).

- **Mountain Dog (MD) Training:** MD Training is the brainchild of John Meadows, the "Mountain Dog" himself. First and foremost, MD manifests as a growing series of structured (12-16wk) **training plans** (with awesome comic book inspired names!) written out (and completed) by John himself, using his 4 Phase workout strategy. The rhyme and reason behind MD Training are explained in John's book called the **Brutality of Mountain Dog Training (which I co-authored**, as John asked me to lend some scientific support to his tried and true methods). To start doing MD training, you can either **buy the book** at www.mountaindogdiet.com, which teaches you how to create your own MD training plans, buy one of John's many programs available **on his site**, or download **his mobile app** and take your MD workouts with you to the gym on your phone.
- **DoggCrapp Training, aka DC Training**, was spawned from training genius of Dante Trudel in the first few years of the 21st century. Birthed in perhaps the most famous bodybuilding discussion board thread of all time, entitled "Cycles for Pennies" (which can be found archived across the 'net), Dante created the "DoggCrapp" moniker to anonymously (for a short

time) proffer his wisdom on “beating the log book,” (progressive overload), hoisting “slag iron,” (muscle mass and strength come hand in hand) and eating to turn one’s body into a “muscle-building, fat-burning blast furnace.” (Search online for his more updated notions on training, which can be found among other places at www.intensemuscle.com.) As it turns out, research has borne out that Dante’s style of cluster sets [called “rest-pause,” a term he borrowed from Mike Mentzer(1637)] may have advantages over straight sets when it comes to increasing muscle fatigue resistance and size(1638), as well as elevating resting metabolic rate(577). When I stumbled across Dante’s writings (before coming to know him personally), I’d arrived and many of the same notions regarding training and diet, so training DC-style was a match made in bodybuilding heaven. After nearly a decade of employing DC training, fine-tuning its notions with myself and clients referred to me by Dante, both during the Off-Season and Pre-Contest, and testing out other training regimes (see my book for details), I eventually developed, beta-tested and published **Fortitude Training®**.

Given their volume and accessibility, there is no need to rehash the methodology of these systems any more than I have already above. They each really stand easily on their own, both theoretically and in the results of thousands of trainees who have used one or both systems. Depending on your personal preference,



any of them can be effective. (What may matter most in success is whether you prefer being in the gym more often with more training volume, ala MD training, the hard-nosed focus on just a few working sets as with DC training, or a flexible approach of Fortitude Training® that puts you somewhere in between.) While many of you reading this have likely developed your own effective training regime and have no desire to explore other programs ("if it ain't broke..."), exposure to new training ideas, even if you choose not to adopt them (fully), may help you fine-tune your current training approach. Still, I would encourage you to experiment, giving whatever regime you choose 100% effort and enough time (at least several months – see below) for results (or lack thereof) to manifest, and also to look at training approaches you consider with a scientific mindset. For instance, programs like [Max-OT™](#) have been used in university research studies(1639), the rationale for [Børge Fagerli's Myo-Reps](#) has been explained in detail online. Lastly, "German Volume Training" has been rehashed and discussed innumerous times online and could serve, in the appropriate measure (1640), as a means of increasing the training volume “dose,” which should be adequate to ensure maximal

muscle gain(31, 63, 64, 1641).

It's important to note that unless your experience dictates otherwise, if a **program/training strategy continues to be productive** (without signs of slowing down), then one is often best served to **ride the program out**: Don't switch programs just for the sake of doing so, but keep in mind that the law of diminishing returns will apply to some degree. (**This is why I trained with DC methodology for the better part of a decade!**) On the other hand, I've repeatedly found over the years that changing one's training approach – using a new or different (novel), but well thought-out training plan or strategy – may help propel gains, simply **because of the novelty of stimulus**. Variation is a basic tenet of training and a principle upon which periodization is built(350, 351, 1642), a strategy known to enhance gains in strength(1617). Ensuring novelty of training stimulus could be considered an advanced periodization strategy(145).

Making gains from switching from one training system to another could manifest mechanistically if, for instance, changing from a higher to lower volume training regime (e.g., MD Training to Fortitude Training®) enhances adaptation because improved fatigue resistance (attained during the high volume regimen) carries over to enhance muscular loading (and the resulting growth stimulus) during lower volume training sessions. On the contrary, a strength-based program might lead to strength gains that result in a greater workload (reps x load) if one then switches over to a higher volume routine. If training with **higher frequency** sets in motion the adaptive processes that promote more rapid inter-workout recovery, then reducing training frequency [a during a training **taper**(1642, 1643)] could produce a **functional overreaching** phenomenon (see [Chapter 2 Special Section on Overtraining](#)) if employed properly. Anecdotally, many advanced trainees do quite well strategically employing 2 -3 favorite training approaches, as long as they pay close attention to ensure adequate recovery year round.

Chapter 3 SPECIAL SECTION: Off-Season “Bulking” & The “Power-Shove” Fallacy

"Powershoving" is an Off-Season dietary approach using the "old school" model of Off-Season gaining or "bulking" guided by a one-dimensional strategy of just "shoving" as much food down your throat as possible. Many of us used such methods as young newbies with raging metabolisms, but I'd say this approach is neither the best nor the healthiest for most bodybuilders. It may be that, near the end of one's Off-Season and/or when pushing to new levels of size overall, that food consumption is a struggle (putting it mildly), but diving right into a "powershoving" strategy can hardly ever be warranted. Here are a few reasons why I believe that.

Bulking up to high levels of body fatness is likely associated with what's known as **anabolic resistance**: **Reduced** skeletal muscle **sensitivity** to the anabolic effects of **amino acids**. (In other words, muscle cells do a poor job of turning on protein synthesis when presented with amino acids.) Anabolic resistance occurs with aging(429) and is strongly characterized by insulin resistance(1644), which we know happens in parallel with gaining body fat (see [Section 3.7](#) for full coverage of Insulin Sensitivity). In fact, substantial loss of insulin sensitivity can come about in a matter of weeks when overfeeding becomes impressive (10% increase in body mass in a month), even before you become “fat”(1645). Thus, gaining weight overly fast does not necessarily behoove you when it comes to gaining muscle.



Powershoving your way to excessive body fat can also lead to higher leptin levels and, eventually, insensitivity of fat cells to leptin and its normally favorable effects on keeping fat mass in check when “overfeeding”(1646). As you might expect, both insulin and leptin sensitivity are co-regulated intracellularly: In mice who had been

“power-shoved” into obesity, administering a chemical that enhances both insulin and leptin signaling caused massive fat loss(1647). Moreover, anabolic resistance of skeletal muscle, as well as insulin and leptin insensitivity, all share a common intracellular root cause (1117, 1648, 1649). In other words, **losing insulin and leptin sensitivity is neither good for your body fat levels, nor gaining new muscle in the Off-Season.**

Also, enlarging fat cells release higher levels of **proinflammatory** cytokines like Interleukin-6 (IL-6) and Tumor Necrosis Factor-alpha (TNF-). It’s not surprising that the typical American diet is proinflammatory and implicated in chronic pain and a number of debilitating, degenerative conditions(1650). (It’s an unfortunately not uncommon sight to see someone “powershoving” with “All-American” fast food...)

Adipose cell inflammatory cytokine release is **reversed by weight loss**(1651), and a diet higher in **fruits and vegetables** is life-extending, healthful(689), and antiinflammatory(1650). Additionally consuming the **omega-3 fatty acids** (EPA and DHA) found in fish oil reduces IL-6 and TNF— production(1652), raises adiponectin levels (promoting fatty acid oxidation), favorably regulates leptin levels (to prevent leptin insensitivity)(502), and possibly (494) potentiates the **muscle protein synthesis-stimulating** effect of amino acids(491, 492). Naturally, we don’t want to eliminate inflammation entirely (it serves a biological purpose), as, for example, the proinflammatory cytokine IL-6 is required “locally” (in the muscle tissue) for satellite-cell mediated muscle growth(1653). On the other hand, continuous infusion with IL-6 (intended to mimic the modest systemic elevations that come with chronic inflammation or obesity) actually promotes muscle **atrophy**(1654). Once again, the message here is that “powershoving” your way into rapid body fat accumulation mode probably not in your best interest if you want to gain muscle mass (and look like a bodybuilder).











Chapter 3 SPECIAL SECTION: Cardio In the Off-Season?

Why Cardio in the Off-Season?

Cardio in the Off-Season might take the form of:

- **Low Intensity Steady State (LISS):** Exercise such as a slow walk, recumbent cycling or a very slow pace on a stepmill or stair stepper, with the purpose simply to burn calories. Example: 20 minutes of walking on a treadmill at a comfortable pace.
- **Moderate to High Intensity Steady State (MISS/HISS):** Steady State exercise (heart rate relatively “steady” [although cardiovascular drift may occur(1655)], but effort levels are moderate to high, typically on a cycle or stairclimber/step mill for most bodybuilders. (By their nature, modes of exercise such as running (jarring), versaclimber (upper body overwork) or rowing ergometers (low back stress) aren't favored by most bodybuilders.) Example: 30 minutes of cycle ergometer exercise at the 90% effort level [or a Borg (6-20) RPE of 17].
- **High Intensity Interval Training (HIIT):** Intermittent “sprint” exercise at a maximal (typically 20-30s) or maximum sustainable (1-2 min) pace/effort interspersed with periods of partial recovery (by resting or reducing intensity to low levels) or full recovery. The programming here can be quite complex(1656), but here are a couple simple examples: 3 x 30s Wingate cycle sprints with 4 min recovery; 12 minutes of 1:00 max effort : 2:00 at 50% of that resistance/pace.

Off-Season Cardio???

DO IT?	DON'T DO IT!
	
 KEEPS YOU LEAN!	 OPPOSES MUSCLE GROWTH
 HABITUAL	 WEIGHTS CAN CAUSE MASSIVE EPOC
 FEELS GOOD	 WEIGHTS = HEALTHY ACTIVITY
 HEALTHY ACTIVITY	 HIIT can be a Pseudo-weight training Option (Don't Overdo It!)
 YOU CAN EAT MORE!	©Scott W. Stevenson

Note here that I'm referring to the **Off-Season** in this section, i.e., that period in your annual plan that comes **after** the Post-Contest period. As discussed in [Section 2.2](#), tapering off of Pre-Contest strategies like cardio makes good sense, but the question addressed here is whether to continue to do cardio in the **Off-Season**. There are several reasons **why you might do so**:

- You have the sense **it keeps you lean** (much as it may

have helped get you lean Pre-Contest), possibly by increasing insulin sensitivity(73) and thus helping to minimize increases in relative body fatness(1657).

- Cardio has become somewhat **habitual** for you [perhaps even with an “addictive” psychological root(1658)].
- You **feel good** after doing cardio(1659).
- You believe cardiovascular exercise (and activity in general) is **good for your heart and general health** (life expectancy)(1178) due to the increase in energy expenditure(1660, 1661).
- You **eat more food** (which you enjoy) when you expend more calories, and eating more means a greater anabolic effect of nutrients and hormones, e.g., essential amino acids(373) and insulin(374).

Why NOT Cardio in the Off-Season?

Those are some good reasons above, but let’s think about it: The best cardiovascular (endurance) athletes in the world do **not** look like bodybuilders, at least the best bodybuilders. Based simply on this form-function association, it’s logical that cardio may counter your goals of gaining muscle size in the Off-Season. Here are some points to consider:

- The well-studied situation of **concurrent training** – training for both strength and endurance simultaneously - points us toward another issue: **Cardio may be diabolically opposed to creating muscle size**(1291, 1662). Specificity of training principle(351) tells us that weight training and cardio stimulate distinctly different cellular signaling pathways(65, 1290, 1663) that **contradict one another** at the molecular level(1662).
- The impact of **resistance exercise** – the way that those of you reading this likely train – on **health** may have been **greatly underestimated**. The critical point here is that its physical activity and energy expenditure, not so much the kind of exercise *per se* (although that is important, too), that is generally associated with cardiovascular health(1178, 1660, 1661). Most exercise and physical activity is simply considered “aerobic”

because it's much easier than hoisting iron [which could be considered “anaerobic”(1664)], so aerobic exercise has the good healthful reputation in this regard.

- Similarly, the sum total impact of resistance exercise on **energy expenditure** may also be a bit higher than many think. Compared to doing cardio(1665) at a good clip (say 140bpm)(1666), you might not burn as many kcal while lifting weights(1667). The **metabolic kick of resistance training comes after your workout**, in the form of excess postexercise oxygen consumption (EPOC). A killer cardio session (even if you're doing high intensity intervals) might amount to a post-workout caloric expenditure of <60kcal(1668-1670). A tough weight training session might net you >100kcal postexercise(1671), and a brutal training session [a dozen sets taken to failure of big movements like squats and barbell presses(576) or just 7 cluster sets(577)] and **your EPOC can amount to over 500kcal** (in addition to the caloric expenditure of the session itself)!!!
- **High intensity interval training** may be a happy medium in that the stimulus of sprint training is more like that of weight training(1291), i.e., a very effective way to reduce body fat(1672) without creating an “interference” effect(1673, 1674). Note here that **for most, HIIT requires programming changes(1675)** (reducing weight training volume) so that it doesn't cut into recovery (especially for the legs, of course).
- Overall, when compare traditionally cardio with HIIT for fat loss, caloric **expenditure does seem to be the determining factor** (in limited studies where fat loss was not substantial) (1676). However, HIIT often does a better job at promoting cardiovascular health, probably because it also elicits **greater training adaptations** (most would say it's harder!) than moderate intensity cardio(1677).

Off-Season Cardio: Make Your Own Call, Coach!

DOING CARDIO ...IF YOU MUST...

WAIT 24-48+ HR
AFTER LEG
TRAINING



CONSIDER THE
CYCLE ERGOMETER



SAME SESSION? ...
THEN CARDIO B4
WEIGHT TRAINING
(UPPER BODY!)



SAME DAY? ...
CARDIO 1ST
THEN WEIGHTS
6+HR LATER



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In being your own bodybuilding coach, you should thus ask yourself:

- Does **cardio slow my gains** in leg size and/or strength (which likely means it will affect size) and do I need more leg size?
- Can I get stay as lean by doing more weight training (which will earn me more leg size)? Do I get plenty of **energy expenditure** from weight training (e.g., via MountainDog or Fortitude Training®) or should I **add cardio** because I do a lower volume of weight training (e.g., Doggcrapp Training)?

- Does **HIIT** make for a **happy medium** for you – a way to get in a quick (albeit not painless) fat-busting cardio session that won't cause you to lose leg size?
- So, if you're still refining your decision regarding cardio in the Off-Season, the bottom line here may be the “**dosing**” as well as **mode** of cardio: The likelihood of an interfering effect is greater if the cardio sessions are **too long**(1291) or **too frequent**(1678) and less likely if performed on a **cycle ergometer**(1291).

Although I prefer folks use more enjoyable life-giving strategies that elevate/maintain caloric expenditure (see [Section 4.3](#) on using **nonexercise activity thermogenesis or NEAT** in a Pre-Contest context), if you **do decide you should do cardio in the Off-Season**, here are my thoughts on programming. To avoid potential interference during the postexercise adaptive period (e.g., protein synthesis is elevated only for about 48 hr or less after a workout(26, 28, 1679, 1680)], I generally suggest that cardio comes **after leg training by a day or two**. This allows the recovery and adaptive processes of the resistance exercise to manifest, and also serves to reduce the frequency of cardio. If cardio must occur during the same session, it makes sense to do so **before training the upper body** (assuming one is doing lower-body focused cardio like cycling). As a last resort, cardio would precede leg training (and hope it doesn't sabotage the weight training session), as this order (**cardio then weights**) seems to do the best to preserve the hypertrophic stimulus of hitting the weights(1681, 1682). Another commonly employed option is do morning cardio, with weight training later in the day, **separated ideally by more than 6 hours**(1683).

Chapter 3 SPECIAL SECTION: Ensuring Recovery (Sleep & Sauna)

Putting the psychologically therapeutic value of training aside, for the purposes of bodybuilding, training *per se* is only the trigger – the carefully crafted motive force – that sets the muscle growth process in motion: Muscle growth itself happens while we’re recovering, typically outside of the gym!

So, like a one-sided coin, training without recovery is worthless (or even detrimental) for bodybuilding progress (see also [Chapter 2 Special Section on Overtraining](#)). Here are some basic guidelines regarding training that can help you to ensure recovery:

- First and foremost, it’s vitally important to be sure that **one's training stimulus does not exceed recovery abilities**. You may have to limit **volume, frequency**, use of set “intensification” techniques, and even **constrain training with certain movements**, such as squats or deadlifts that require tremendous nervous system engagement. The **recovery abilities of different muscles** should also be considered. (E.g., empirically, the back musculature can handle a greater amount of direct training than the arm muscles, perhaps in part because the arms are involved in training most other muscle groups.)
- Periodize your training, which means **periodizing your recovery with deloading periods**.
- Include non-gym related activity, aka “**active recovery**”(1684)] as well. This could include outside fun recreational activities like hiking, low-key game playing, fun activities at amusement parks, *etc.*

However, the recovery side of the equation can also be improved. The advantage in doing so is that enhanced recovery may permit a greater training stimulus and thus greater adaptation (1685) which, over the long haul, means more muscle mass!

Obviously, **diet** plays a huge role here, which is evident when comparing how you feel at the height of your Off-Season with the drained feeling brought on by low calories (and body fat) in the weeks before a contest. It's been my experience and that of clients that that peri-workout recovery supplementation ([Section 3.8](#)) can improve recovery substantially. This Special Section on recovery, however, is a brief overview, focused mainly on making you aware of **non-dietary**,

strategies not directly related to training.

A multitude of non-diet-related recovery strategies have been studied, including (1686):

- **Treatment modalities** such as massage, cryotherapy, contrast water baths, hyperbaric oxygen and compression garments.
- **Drugs: nonsteroidal antiinflammatory drugs (NSAIDs).**
- **Muscle activity-related strategies:** active recovery, stretching and even electromyotherapy.
- **Various strategies in combination.**

Most of these recovery strategies have not been **well** supported by research(1686), although some have, such as the use of compression garments to reduce muscle soreness(1687). On the other hand, an approach like cryotherapy that **reduces muscle soreness**(1686) may also **impair exercise adaptation**(1688, 1689). Still, few such studies have been performed (or at least published in journals I have easy access to) investigating recovery modalities' effects on hard-training athletes(1686), much less bodybuilders, so some exploration is warranted here.

Also, **we're all different** regarding lifestyle, training intensity and recovery ability, as well as how well we handle all of life's other stresses. The time it takes to recover from a workout varies substantially among individuals (1690) and across muscle groups, and may not be the same each time you train even if you do the same workout(1691). Similarly, interindividual differences may make it such that **one recovery strategy may work for you**, but not for your training partner (and vice versa), not to mention that your ability to recover from different aspects of training (frequency, volume, etc.) may vary. Additionally, it's possible you can “**overdo**” **recovery strategies** such that they impair rather than enhance recovery [e.g., daily prolonged, overly heat-stressing sauna (see below) and/or overly frequent, excessive deep tissue massage]. Becoming your own bodybuilding coach may mean trying out these strategies for yourself.

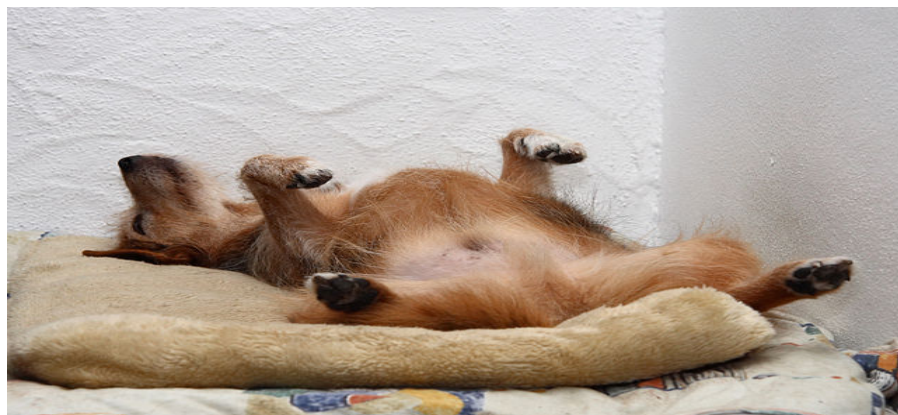
I have noticed over the years that one fairly **common personality trait** of many of the world's best bodybuilders (consider Ronnie Coleman and Jay Cutler) is that, outside of the gym, they are **cool, calm and collected**, and generally easy-going and happy. Not being stressed out, when you're ideally recovery fully from training, is in your best interest as a bodybuilder. This may not be your natural inclination, but luckily **mindfulness training such as visualization, meditation and muscle relaxation** are strategies you can employ to aid in recovery(1692), and calm your nerves before competing(1693,

1694). Meditation can reduce resting state cortisol levels(1693), and guided imagery and progressive muscle relaxation can reduce anxiety levels (1694). Meditation training has even been shown to speed the recovery of blood lactate levels after exercise(1695).

There are **many resources** when it comes to mindfulness/ meditation training, including books, classes, apps for your smartphone, not to mention local meditation groups (via meetup.com for instance). If you sense that some form of stillness practice (which could even mean yoga, Qi Gong, Tai Chi, etc.) might benefit your overall stress levels, including one or more of these practices into your lifestyle could very well make your bodybuilding (and **the rest of your life**) more gratifying.

As a reminder, I encourage you to employ the Perceived Recovery Scale (see Chapter 2 Special Section – Overtraining) and perhaps start measuring Heart Rate Variability (also found in Chapter 2 Special Section – Overtraining) to gauge whether a given recovery strategy is actually effective for you personally.

Recovery Basics: Sleep



Sleep is (ideally) the penultimate recovery experience: It's the yin (rest and repose) to the yang (fight and flight) of training. The “autopilot” (autonomic) aspects of our nervous system (ANS) dictates these relaxation (recovery) and arousal states, as well as our circadian rhythm. If sleep deprived, both the ANS and physical performance is thrown into a tailspin(1696-1699). Sleep deprivation wreaks havoc on your body. More specifically, sleep deprivation (which can come via **sleep apnea** of course):

- **Negatively impacts gym performance(1696-1698)** reducing the stimulus for adding muscle!
- Promotes **insulin resistance(1700)**.

- May also impair **insulin release**, leading to hyperglycemia(1487).
- Decreases **life expectancy**(1700).
- Reduces spontaneous activity(1701) – think NEAT here!
- Promotes(1702) **overeating** relative to energy expenditure(1703, 1704), specifically for sugary foods(1705).
- Tends to promote **accrual of body fat**(1700), perhaps by increasing **ghrelin**.
- Slows **metabolic rate**(1706), probably by **reducing leptin**(1705).
- **Sleep apnea**, in particular, activates the sympathetic nervous system, elevating cortisol, systolic blood pressure, and blood glucose and fatty acid levels (1707).
- Generally **upsets hormonal and metabolic control**(1486, 1702, 1708), in particular by increasing **ghrelin**(1705, 1706), which would promote fat gain(1709).
- Chronic sleep deprivation may even **predispose you to injury**(1710).

As you might have suspected,

THE IMPORTANCE OF SLEEP!



**GYM
PERFORMANCE**



HEALTH

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**PROMOTES
OVEREATING
(CARBS)**

**SLOWS
METABOLISM**

**SLEEP
DEPRIVATION**

**ELEVATES
Ghrelin**

**REDUCES
LEPTIN**

PROMOTES ADIPOSITY!

SLEEP APNEA

- **INCREASES BLOOD PRESSURE**
- **INCREASE BLOOD GLUCOSE**
- **REDUCES INSULIN SENSITIVITY**

tolerance to sleep loss varies dramatically^(1711, 1712), and probably has a genetic component⁽¹⁷¹³⁾. Anyone who has dieted down into extreme leanness has most certainly lost some sleep along the way, a phenomenon probably linked by the neuropeptide **orexin**, which regulates both arousal and appetite, presumably to drive us to seek out food at night if energy balance is critically low⁽¹⁷¹⁴⁾. Most importantly, if you have sleep issues, how can you diagnose and

address these?

Evaluating and Improving Sleep?

If you sense you have sleep issues, don't hesitate to investigate the possibility that you have (obstructive) sleep apnea (OSA). OSA can affect those of average body composition and size(1715, 1716) and extensive research of NFL football players(1717-1720) tells us that **muscular men are a risk**(1721) [especially if you have a **large neck**(1720)]. A **sleep partner** can help determine if you stop breathing in your sleep(1722), but is not a substitute for a trip to your physician (or another **qualified medical professional**) for a sleep study (polysomnographic) test.

Although the more fit you are, the less likely you are to feel sleep deficient(1723), more than **10% of high-level athletes** may have clinically important **sleep issues**(1724), as assessed by a validated sleep assessment questionnaire. It's a fair bet that the rate of sleep issues could be much higher if we polled Off-Season, maximum bodyweight (water-logged) and Pre-Contest, hunger-ridden bodybuilders(151).

SLEEP TIPS & TRICKS



Ensure Enough Time!



Regular Pattern



**Bedroom is a
Sanctuary**



Avoid Late Day
Stimulants

@Scott W. Stevenson



Bed-Time
Ritual



Manage
Blue Light

More Daytime

None @ Night

**Consider a
Sleep Aid**



Large Meal w/ Carbs Before Bed



Manage Fluids &
Minerals



Nap!

But Don't Cut Into
Nighttime Sleep...

Aside from a clinical evaluation of a sleep disorder, the following aspects of sleep hygiene can help with sleep issues:

- Set a timely, regular **sleep and wake pattern**.

- Set aside **enough time** (duration) to get the sleep you need.
- **Avoid stimulants** such as caffeine, which reduces melatonin release (923), if at all possible, especially late in the day.
- Create a **ritual before going to bed** of “turning off.” Shut down electronics, dim lights and put away or step away from sources of heavy mental stimulation (especially work related). It can be a helpful habit as well to spend a moment **reflecting on the positive experiences** and aspects of your life for which you are **grateful**, as this can create a restful mindset.
- Make the **bedroom a sanctuary** for relaxation.
- **Minimize exposure to (unnatural, i.e., human-made) sources of light** at night, as light powerfully entrains our circadian rhythm and sleep-wake cycles (1725-1729). This may require blacking out windows in sensitive individuals and concealing sources of **blue light**, especially (1730, 1731), which preferentially activates the non-visual photopigment **melanopsin**-containing neurons in the retina (1725) and has an arousing effect on the limbic (“emotional”) brain areas (1732). [This effect is salient enough that that blue light therapy can be used for treating mood disorders (1733)]. For instance, wearing blue wavelength-blocking (<550nm wavelength) glasses at night promotes better sleep (1734) and, for those who must, software exists to selectively diminish the **blue wavelength** from computer displays during the evening hours. Conversely, enriching the workplace with blue light during the day (as one might see in the sky during a clear day) improves alertness, productivity and sleep (1735).
- **Consider employing an effective sleep aid**, i.e., one that contains melatonin, L-tryptophan (151, 960) and possibly valerian (918-920), such a product from the **TrueNutrition brand**. (See also the **Section 3.6 Note on Sleep Aids**.)
- **Make your meal before going to sleep** count. Having a **larger meal** before bed can actually have a positive impact your body composition (813, 814) and makes

sense for delivering protein throughout the night(400), as you'll likely not be eating again for many hours. Overall, the research suggests that a pre-bed meal that favors good sleep (duration, quality and time it takes you to fall asleep) is one that is (calorically) large, and high in **protein** and **carbohydrate** [and of a high glycemic index if eating >1hr before bed (151)]. However, **your mileage may vary** (being overly bloated and thus uncomfortable doesn't bode well for good sleep), so don't hesitate to find the strategy that works best for you.

- Manage your **water** (less) and **electrolyte** (generally more) intake such that you can **avoid frequent urination** during the night(960).
- When sleep is indeed impaired, making up for lost sleep with **naps** [e.g., after lunch(1736)] may be helpful(960, 1737), as long as the naps are increasing sleep recovery (and not cutting into sleep time at night).
- Lastly, you might consider sleeping under a **weighted blanket**, which has anecdotal but poor scientific research supporting a positive effect on sleep quality among children with an autism spectrum disorder(1738-1740), but one recent study of otherwise healthy subjects (20-66yr) found that a weighted blanket reduced **restlessness** during sleep and improved ease in **falling asleep** and perceived **sleep quality**

Sauna for Detoxification and Recovery

Not terribly long ago after a workout with John Meadows at one of his regular gyms in Ohio (which happens to have an oft-frequented sauna), we came to realize how many folks we know swear by saunas. So, I looked into it, wrote an article for John's site and am sharing much of that information here: As it turns out, there's more to this practice than just a heat-induced state of relaxation. In particular, for those (many) of you who use a variety of supplements as part of your bodybuilding regimen, sauna can be a very helpful and straightforward means aiding in recovery simply by expediting the **exodus of toxins** from your body, which may be why sauna has been popular in Scandinavia for centuries [Finland in particular (1741)].

You see, many **supplements** contain a variety of (designer) steroid residues(1742-1744), including even non-hormonal

supplements(1742, 1743). Even **creatine**(1745) and natural **health products** (e.g., herbal remedies)(1746) may even be tainted with toxins, including mercury and other heavy metals far above accepted safe levels. **Vegetables and grains** may be high in cadmium(1747-1749), and even “**organic**” may not completely solve the problem of heavy metal intake(1750). Staying **at home** also exposes us to **chemicals** in building materials and cleaning supplies, as well(1751). Pharmaceutical and personal hygiene products may also make their way into **our water supply**(1752), not to mention perchlorate(1753) a potential thyroid disruptor(1754) that nearly every American has likely been exposed to(1755). One might also be concerned with endocrine-disrupting phthalates found in plastics (1756), the array of issues [including cancer(1757)] caused by pesticides(1750, 1758, 1759) and lipophilic drug residue toxins that can wreak havoc for many moons while slowly leaching from stored body fat and cell membranes (1760).

So, you guessed it: Sweating in a sauna is a way to clear away chemical toxins. For example, recreational drug chemical residues are found in the sweat(1761, 1762). Heavy metal toxins like cadmium ((1763); see above) and antimony [a metalloid with toxicity similar to arsenic(1764) are actually concentrated in the sweat, as are lead(1765), mercury, and arsenic and(1763)]. Even if **undetectable in the blood**, these and other toxic metals, as well as Bisphenol A (an estrogenic, endocrine-disrupting compound found in plastics) may be **released in the sweat**, especially in people who are fatigued, depressed or otherwise psychologically disturbed(1766).



A coordinated program of exercise and nutrition that incorporates regular sauna sweats have been shown to improve well-being and fatigue levels in **police officers**(1767) and **firefighters**(1768) who had **occupational chemical exposure**. This kind of system(1760, 1769) has been shown to reduce blood levels of chlorinated toxins (like perchlorinated biphenyls; **PCBs**)(1770, 1771), even though PCBs do not seem to be acutely lost in sweat(1772).

If it was just about sweating, couldn't we just get that done in the gym?... Well, it seems that regular sauna trips have an immuno-boosting effect evident in cases ranging from the severe immunodepression seen Chernobyl survivors (1760, 1773) to staving off the common cold(1774) [at least in adults(1775)]. Sauna can improve the lipid profiles(1769, 1776) and even reduce the pain of fibromyalgia(1777). These general health effects may explain how sauna treatments lower the levels of toxins that are not released in the sweat (see above).

The Finns have been on to something with how to get the most out of the sauna. Because it activates the sympathetic nervous system(1778, 1779), sauna can raise cortisol levels(1779), which they counter with cold (but not too cold) post-sauna immersion and recovery periods at room temperature. A complete cycle (**sauna + cool water + room temp recovery**) might last 5-20 minutes and be repeated **several times** depending on personal preference(1777). [If the cooling period is too cold (e.g., an ice bath), this may actually raise cortisol(1779, 1780), which we don't want.] If you've done it right, you should notice reduced anxiety afterwards(1781) and even a beta-endorphin-mediated elevation of mood(1777).

If all of these health and recovery benefits weren't impressive enough, it's possible that saunas may help more directly with **building and holding on to muscle mass**. Heat stress induces the expression of what are aptly named **heat shock proteins** in skeletal muscle(1782, 1783). In animal studies, just a single (60min) bout is enough to protect against disuse atrophy many days later(1782). More regular heat stress (30min every other day) treatment not only slows immobilization-induced atrophy(1783), but also speeds the recovery of muscle mass when it's remobilized. These animal studies suggest that heat stress also improves cellular **resistance to free radical stress**(1784) and even **insulin sensitivity**(1785, 1786). (See [Section 3.7](#) for more on insulin sensitivity) Naturally, a sauna represents a **risk due to heat stress** or simply overdoing it(1787, 1788), in particular in those using blood pressure medications(1777), so go easy with your sauna use. (As with exercise, I recommend **checking with your doctor** before engaging in a regular program of sauna use.) Remember, the sauna would be used for **recovery purposes**, not to increase your stress load, so keep a **hedonistic mindset** if you decide to add the sauna to your recovery regimen.

Chapter 4 – Pre-Contest (2-4 months)

“Not bricht Eisen.” –German saying that translates literally as “Necessity breaks iron,” i.e., “Necessity is the mother of invention.”

Pre-Contest dieting is a balancing act: The goal is to hold on to muscle mass (with a rare possibility that you might gain a bit of muscle) and lose essentially as much fat as humanly possible. A few rules of thumb become evident in this case.

4.1 Pre-Contest Dieting Rules of Thumb

- **Protein is Very Important: Eat Enough and Spread it Throughout the Day.** In the most extreme cases of fat loss studied clinically, where caloric deficits are tremendous (patients are essentially fasting), taking in adequate protein is paramount. This is reflected in the very low calorie “protein sparing modified fast(PSMF),” where protein is the only macronutrient(1789, 1790). Compared to a mixed macronutrient, equally low calorie approach, PSMF produces much **more favorable changes** in body composition, including greater rates of fat loss(1791). More to the point (see [Section 3.2](#)), during more practical dietary approaches and when resistance training, protein has advantages of creating greater **thermogenesis**(357, 421) and greater **satiety**(95, 1792), not to mention **preserving**(376, 390, 412, 1793) or **promoting gains**(395, 396, 410, 1794) in muscle mass, and promoting **greater fat loss**(1793, 1795). A very recent study found that with the same caloric deficit, training while taking in a greater amount of protein (2.4g/kg/day and post-workout protein timing strategy – versus – 1.2g/kg/day) can accelerate fat loss **and** even produce gains in muscle mass (in newbies to training)(410). Previous work suggests as well that maintaining protein influx over the course of the day, i.e., “**protein pacing**” (e.g., via a “slow” protein like **casein**(400)) or spreading out protein doses [~20-40g(365) every ~3hr] in a way that **maintains elevated blood amino acid levels** may also be advantageous(397, 398, 1793, 1796). [This would thus include using casein as a **nighttime/before bed protein**(387, 388, 399-402, 659, 1466)]. Fear not though, as despite what you may have read or heard, even **eating a caloric “excess” in the form of extra protein** is very likely to result in fat gain, even if on the order of 4.4g/kg/day (or >400g/day for many of you reading this)(98).
- **Take Your Time, Especially as the Diet Progresses.** Pushing the diet too hard and too fast can have disastrous effects on **physical performance**(1797) and be **hazardous to your health** when taken to extremes(1798). In other words, dropping weight too

fast is also going to impact **how hard you can train** in the gym(674): If you can't train hard, you'll the diminish the **training stimulus** that brought you that hard-earned muscle mass. So, **setting aside enough prep time** can very much be in your favor, as the energy deficit (which dictates how fast you can lose fat) is a predictor of the possibility of muscle loss(673, 674, 1799). While it is true that fairly large caloric deficits (>700kcal/day) can be applied **over the short term** (a few weeks) with minimal risk of losing muscle or strength(675) or eliciting compensatory metabolic adaptations(677), the leaner you are, the greater your risk of losing muscle mass(675) and even steroid use may not afford 100% protection against losing size if you diet too hard(676). For example, a practical "field study" of Olympic level athletes (of various sports) found that, for a given amount of body weight lost (~9lb), a training program and diet designed drop about ~1 lb/week resulted in more fat loss and an actual **gain** in fat free mass, compared to an overly aggressive program geared to produce about a 2lb loss per week(1800). This may prove difficult when you make the psychological switch from Off-Season to your Pre-Contest diet. **Patience will be a virtue** that pays off on stage in this case. (See [Section 1.3 Common Goal of Moving up a Weight Class](#) for more on getting a handle on ensuring you have enough time to get in shape by show time.).

- **Plan To Take Time OFF Your Diet: Off Weeks, “Non-Dieting” Meals, “Cheat” meals, ReFeeds, Etc.** Limited research suggests what other coaches and I have found to be the case: Having some **planned off time from your diet** is to your advantage. (Sometimes this is referred to as “**toggling**” between periods of higher and lower caloric intake.) For example, a strategy I’ve employed in the past is taking **one week off** dieting (eating to maintain body mass, allowing for glycogen replenishment) for every month of a given diet. Of course, this may mean starting your Pre-Contest period earlier, knowing **you’ll not be in a caloric deficit continuously**. The tradeoff can mean holding on to more muscle mass(1801), even if you're carrying the same absolute amount of body fat on stage, looking much better (less "over-dieted"). A recent study found that interjecting 3 days of unrestricted eating (perhaps a

bit too long and too unstructured for **Pre-Contest** dieting, especially for those who can really put the food down) every 11 days actually aided fat loss, as well as feelings of hunger and “suffering” (satisfaction)(1802). Preliminary research suggests that simply increasing carbohydrate on the weekend can help promote retention of fat-free mass without slowing fat loss(1801).

[Animal research demonstrates that weekly 1-3 day refeeds – in the context of a caloric deficit overall and on other days of the week – **don’t impair weight loss**. In other words, properly constructed, a re-feed may permit one to eat more food and lose just as much fat(1803)] Even more impressively, the MATADOR (Minimizing Adaptive Thermogenesis And Deactivating Obesity Rebound) study found that obese men who alternated two week blocks of energy deficit with energy balance lost more fat and preserved metabolic rate better than those who dieted for 16 weeks with a persistent daily energy deficit(1804). An intermediate approach I've used for many years now with great success involves approximately three weeks of dieting (with post-workout nutrient timing in place), alternated with 1 week of eating at caloric balance [I forgo the calculations(1805) typically shoot for $\sim 15\text{kcal/lb/day}$]. This is psychologically much easier as contest prep can be seen simply as a series of short 3 week diets. (For more on refeeds and "cheat meals," see [Section 4.5](#).)

PRE-CONTEST RULES OF THUMB



**PROTEIN:
EAT ENOUGH & SPREAD IT
THROUGHOUT THE DAY**

**TAKE YOUR TIME:
DON'T PUSH TOO HARD,
TOO FAST**

PLAN TIME OFF THE DIET:
• NUTRIENT TIMING
• PERIODIC RE FEEDING
• OFF WEEKS

**GET THE MOST FROM
THE LEAST!**

PLAN AHEAD!!!

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- **Get the Most from the Least.** It's best to add in or exploit just one (or perhaps two) means of fat loss (diet, cardio, supplements, *etc.*) at a time, to the least extent needed to evoke a reasonable change in body composition, as well as possibly rotate among those approaches. The purpose here is to exploit the **initially rapid response to a given new stimulus/approach** and avoid using multiple approaches simultaneously such that one runs up against a **ceiling effect** (response is maximized) in terms of fat loss, and also avoid "tolerance"/adaptation to that particular strategy. [By way of a simple, purely hypothetical example, one might imagine that if each of three strategies that could net 5lb of fat loss if used sequentially (totally 15lb total). However, if all three strategies were employed concomitantly, one might run up against a (biologically-based) ceiling effect that constrains the (maximal) rate of fat loss such that one nets only 12lb of fat loss before tolerance renders them largely ineffective.] This

sequential application of fat loss strategies is a common (sense) practice in the bodybuilding world – albeit one that requires patience – but is largely unexplored scientifically. Still, it's largely accepted that drug (e.g., a nutritional supplement such as caffeine) tolerance is a special case of physiological adaptation whereby the drug's influence on homeostasis (e.g., lipolysis in the case of caffeine (870, 1806, 1807)) is reduced over time(1808). Conversely, a drug's greatest effect is typically upon initiating its use (and/or after a period of abstinence). A clinically relevant example of this idea of “getting the most from the least” and taking advantage of the initially larger response to a novel stimulus/stress comes by way of **drug tolerance to opioids** (which are prescribed to ameliorate pain during cancer treatment). It's actually been demonstrated that rotating the opiates used and/or the route of drug administration can **avert tolerance** and maintain pain relief while avoiding side effects(1809). (Incidentally, one could also conceptualize the rule of thumb to “take time off the diet” as an extension of strategy to avoid developing “tolerance” and preventing adaptation to a caloric deficit and other Pre-Contest fat loss strategies.)

- **Plan Ahead:** As I've already mentioned (or insinuated), the three preceding bullet points require that you **plan ahead** with regard to **when** you transition from the Off-Season to the Pre-Contest period. Still, I think this is worthy of its own bullet point. In particular, Pre-Contest this means keeping in mind how much body fat you have to lose to be in contest shape on show day (and how long that will reasonably take you). For more on this topic, see [Section 1.3 Common Goal of Moving up a Weight Class](#).

Pre-Contest Expectations – The Mind Games

The shift from Off-Season to Pre-Contest Dieting can be a welcome experience, as well as one fraught with second-guessing and the beginning of Mind Games. Keeping the following in mind can help you realize that what you're experiencing is probably very normal:

- It's normal to drop a decent amount of weight relatively quickly, simply from “cleaning up” an Off-Season diet

(e.g., removing high sodium, generally inflammatory, processed “junk food.”) This is **mostly water weight** not fat, and can make you look better quickly, however.

- On the other hand, the loss in **muscle fullness** can give some competitors the sense they **look worse**, until conditioning (low body fat) is more noticeable. This is also normal.
- Be wary of **hurry-up strategies** and **quick fixes** that are unsustainable. These might just accelerate fat loss but risk muscle loss. As I mention above, slow n’ steady wins the race here, so be sure to start your Pre-Contest diet with ample time to be contest ready on contest day. Losing muscle is generally not to your advantage.
- On the other hand, **extreme results** will require **extreme dedication**. The seasoned competitor will know what overkill is and when it's simply time to dig in. To some degree, this comes with time, experience and taking notes with each competition season. When **judging your conditioning**, look to the area where you hold **the most body fat**, rather than the areas where you look the best (leanest). For men, this will often be abs and the "love handle area," and for women, glutes and thighs. Get shredded in those areas, and you'll rarely not be lean everywhere.
- There will likely be times when you **compare yourself** to others (who are better or more advanced competitors than you) and look at yourself in a mirror and perceive a **distorted image**. (I call these “**body dysmorphia days**” and often make note, even by verbalizing it, if and when I'm having "one of those dysmorphia days.") Psychologically attaching to this perception usually does little to make you a better bodybuilder (or a happier person), unless you can use it consciously and constructively as a way to improve. Consulting with an objective eye (another coach) or pictures/video you have of yourself may help objectify your situation. If you are like me, you learn to laugh an internal laugh (or at least smile a bit) when these old familiar mind games start to play out, and doing so may even help you reframe the big picture of your bodybuilding pursuits from a place of gratitude. ("Gosh, here I am

fretting about the size of my calves when I've really got so many other great things to focus on and be grateful for.)

- You will have **supporters** and **those who don't understand**, and maybe even some who try to sabotage your efforts. Stick by your supporters and try to understand the real underlying reasons (e.g., genuine concern or perhaps even jealousy) why some folks may not have your back as you prepare.
- Recognize that you may just have **some stumbling blocks** and **setbacks** when dieting, including even an overdone binge/unplanned cheat meal where you “fall off the diet wagon” to some degree. Here are some suggestions for addressing these missteps.
 - See the Big Picture, considering how long you've been dieting, how much progress has been made, *etc.* in the context of what kind of set back you've actually created. (One meal or missed workout can't undo months of training and preparation.) Also, take these occasions as opportunities to attempt to figure out what went “wrong” so that they can be prevented in the future.
 - Consider constructing your diet and Pre-Contest period (i.e., start dieting earlier) to allow for times when there will be an inadvertent slowing of progress or even planned period when not attempting body fat loss *per se* (a break from the diet). (See [Section 4.1](#) above for more on why this makes sense.)
 - Only so much body fat can be accumulated at a single sitting, but a significant amount of water retention is undoubtedly possible especially if you've consumed a good bit of sodium-laden food. Don't mistake the two and give it a couple of days after “cheating” before assessing the damage. (That cheat meal might have just done you some good!)
 - Forming body fat from carbohydrate (via *de novo* lipogenesis) is improbable during a single binge session([1810](#)).
 - Beware the abstinence violation effect([81-83](#)), whereby a single violation (of the rule to only eat

on-diet foods, as a prime example) can lead to a loss of self-regulation that brings about multiple days of overeating(1811, 1812). In other words, don't think that all is lost and throw in the towel if you've "blown it" for a day or two. Just get right back on the horse and proceed from where you left off.

- "Cheat Meals" can possibly be beneficial (see [Section 4.5](#)), so use them if/when needed, i.e., consider incorporating refeeds into your diet.

4.2 Pre-Contest TRAINING: Dance with the One Who Brung Ya

Although the message of this Section is simple and relatively short, I felt obliged to address Pre-Contest training specifically in this Chapter, given its relative importance and the unfortunate fact that so many people often self-sabotage when it comes to training before a show (in part because the "mind games" mentioned just above cause them to second guess their training strategies).

The bottom line here is encapsulated in the old saying: "Dance with the one who brung ya." In other words, it's the same **brutal training efforts** – providing high mechanical tension and metabolic stress – that produce muscle gains(59) in the Off-Season which will help you keep those gains when dieting Pre-Contest(1813)[e.g., by preserving muscle protein synthesis(412)], especially if you also are sure to keep protein intake high(410). On the other hand, recovery is obviously impaired by the dieting process, and training must be adjusted – there's just no other way around it in many cases. First and foremost, it's my experience (personally and with clients),

+ that, with the caveat that one must **train safely** and avoid injury, that the primary adjustment to training during the Pre-Contest period should be in reducing **training volume** (by **reducing workout volume and possibly frequency**), rather than by (intentionally) lightening loads used across the board. Note that this would generally preclude adding lighter sets to make up for lesser effort, although there may be days when this is necessary when the diet becomes treacherous. Also, this strategy of reducing volume should **only** be applied **as needed** – not merely because you are now in the Pre-Contest Period – when it's clear that your recovery is impaired. Ideally, you maintain as much of the Off-Season training stimulus as possible (both volume of training and training loads), but the strategy here is to reduce volume (amount) of training and maintain quality (loads/ reps with given loads) per the form follows function principle. If you are able to **preserve multi-repetition maximum strength** (e.g., 6-12RM loads) during the course of a multi-month Pre-Contest Period, then you will be more likely to **preserve muscle mass** than if your multi-RM strength has plummeted Pre-Contest (e.g., from a training approach of employing only lighter weights and more, but less effortful sets)(1814).

Some strength loss is usually unavoidable Pre-Contest. Of course, use of anabolic/anti-catabolic pharmaceuticals that may also have a neurological effect on aggression, vigor and thus strength, such as AAS(1815, 1816), even if only acting via a placebo effect(267), and

can thereby help with retention of strength and size. (It's not uncommon in individuals who use AAS sparingly during the Off-Season, and then increase (or only administer) doses during the Pre-Contest Period for gains in muscle mass to coincide while losing body fat.) Of course, it's sensible to **avoid lifts below the 6-8RM** range in the **final weeks** before stepping on stage due to injury risk, but training as hard as (safely) possible in the gym, while adjusting diet, ensuring NEAT and possibly adding in cardio should it be necessary, as the principal means of ensuring fat loss.

Weight training is not an exceptional way to expend energy **during a workout**(1665, 1667), but **high effort, large muscle mass** resistance exercise can produce substantial (“excess”) postexercise oxygen consumption (i.e., calorie expenditure quantifiable as “EPOC”) on the order of >700kcal after a single session(576, 577). In **Fortitude Training®**, Volume Tiers are laid out in part for this reason, so that one can “dance with the one who brung ya” but just with a little less training volume by sticking with the same training regimen with reduces sets/workout. As I mention above, a misguided, fat-loss focused Pre-Contest strategy based on increasing training volume with lighter weights and easier “pump” sets can actually backfire: If you replace a brutal (often to muscular failure), heavy and hard Off-Season training with less effortful (easier sets), but higher volume (more sets) training, you might even triple whammy yourself by: 1.) Removing the quintessential aspect of the exercise stimulus – trying to exchange quality for quantity – that built your physique (and newly attained muscle)(62, 1568, 1817-1824); 2.) Shortchanging yourself significant postexercise oxygen consumption, which is paltry after resistance exercise using light loads or mainly single joint, machine-based isolation exercises(1669, 1671, 1825); and 3.) Perhaps even cutting further into your recovery abilities by performing “wasted sets”(660). Together with the lack of recovery resources that comes with a Pre-Contest caloric deficit, I’ve **seen this light weight, “pump it out” approach make for a treacherous recipe** that results in loss of muscle mass, more difficulty in stripping away of body fat and a “tired,” “over-dieted” physique come contest day. (As an aside, my guess is that this kind of strategy may be rooted in bodybuilding of decades past when AAS were used only Pre-Contest, thus countering catabolism and improving recovery such that many such bodybuilders could “grow into the show” with this kind of training approach.)

4.3 Pre-Contest Dieting Down: The Nuts N' Bolts of Getting Shredded (& an Example)

Although the process actually ends up being more of an organic and even artful process, I've organized Pre-Contest Dieting into Four "Steps." I don't do this to be intentionally pedantic, but in hopes that this kind of structure will help you, in being your own bodybuilding coach, to more clearly see the forest from the trees during what can be a stressful time. Most of what you end up doing "in the trenches" during this period is a matter of Steps 3 and 4, but neglecting the first two steps is a recipe for disaster.

- **Pre-Contest Step #1:** Outline Your Perspective. (Who is the Coach?)
- **Pre-Contest Step #2:** Set Your Goals and Dieting Parameters.
- **Pre-Contest Step #3:** Employ Pre-Contest Dietary Strategies!!!
- **Pre-Contest Step #4:** Ensure Progress and Breaking Through "Fat Loss Plateaus."

Pre-Contest Step #1: Outline Your Perspective. (Who is the Coach?)

Perhaps the most sought-after service of bodybuilding coaches is guidance during the Pre-Contest process of dieting down. This is where the rubber meets the road, discomfort due to **hunger and fatigue is greatest** and one's ability to make decisions, be it which foods to eat, how much to eat, and/or how to adjust training, become so difficult that **many individuals simply cannot successfully weather the storm alone**, and thus feel compelled to hire a coach.

On the one hand, hiring a coach can be helpful in that this is a trial by fire way of learning new techniques, twists and perspectives on the dieting down process employed by said hired coach. However, for one to reap these benefits, **paying attention** to what one's coach is doing and having a coach that is willing to **answer questions**, to **teach** and **provide rationale** is mandatory. Otherwise, this could be considered a form of "hand-holding" from the perspective on one who wishes to harvest personal growth and knowledge from the Pre-Contest journey. Still, some who see bodybuilding as a team sport – bodybuilder, coach, spouse, friend, *et al.* – might conceive of the coach

as intelligent use of resources. A bodybuilder who knows his strength is in "carrying out orders" might be very successful (in terms of the final onstage "product") in hiring a (good) coach, because each and every directive is carried out exactly, thus minimizing the "imprecision" that comes with bodybuilders who stray off-plan as the show approaches.

On the other hand, for those of you (probably many of you reading this book) for whom bodybuilding is more so a path of **personal exploration and growth**, a **reaping of knowledge** and even an **artistic pursuit** (like a painter whose canvas is his body), the difficulties of prepping oneself constitute **the sought-after challenges** from which physical, mental, emotional and perhaps even spiritual development is borne. To hire a coach to take over when time gets tough certainly makes sense when months of hard work are threatening to be lost during the weeks before a show. However, doing so prematurely **denies the thinking (wo)man's bodybuilder the opportunity for those particular deep insights** that come from the first-person struggle to find the proper manipulation of training, diet and supplementation. Perhaps even, if there are to be internal goods (1826) or life lessons to be had from the pursuit of bodybuilding that would somehow enhance our lives otherwise, **bypassing these stressful events** (like quitting in the last round of a boxing match) might also **forfeit these bodybuilding virtues** (without which, some might argue that bodybuilding is little more than an exercise in self-serving narcissism).

Of course, there is some middle ground between absolute hand-holding and the lone wolf approach, and the self-educating "lone wolf" intelligently edifies himself by scouring the web, asking questions on discussion boards, consulting resources such as this book, and conversing/consulting with trusted bodybuilding friends and coaches. Indeed, sometimes the wisdom borne of "going it alone" to the very end entails knowing that one needs a watchful, re-assuring eye in a coach who will simply help ensure that one sticks to a previously constructed plan, and doesn't do anything "stupid" that one ought to know better than to do.

Pre-Contest Step #2: Set Your Goals and Dieting Parameters.

At this point, regardless of your Off-Season progress, your next destination is the stage, and re-setting goals makes sense. Hopefully, you've made the turn into Pre-Contest dieting in time to reach the level of leanness you need (and meet or exceed any mass gaining goals you may have set). See the [Section 1.3](#) for more on Goal Setting and,

in particular, the discussion on the goals of [Adding Size and Moving up a Weight Class](#). In the Pre-Contest context, you will need to consider, based on your current body composition, the rate at which you will need to lose body fat to have a trajectory toward true stage-readiness on the date of the show. Things to consider/do at the start of your diet are:

- If, based on the above, your experience and/or common sense, you won't be ready in time for your show, you might consider another show.
- Review and/or fill your [Personal Bodybuilding Inventory](#) (PBI; see [Section 1.1](#)) again in the context of the Pre-Contest period.
- From the PBI, make particular note of the Fat Loss Strategies that **have worked** and those that have **not worked**, and remind yourself what your dieting tools are, and what tools are off-limits, so you'll have all your potential Pre-Contest strategies laid out before you (see below).

Pre-Contest Step #3: Employ Pre-Contest Dietary Strategies!!!

Now's the time to re-read the Rules of Thumb at the beginning of this Chapter ([Section 4.1](#)), especially if you haven't picked up the book recently. As a reminder, these include:

- **Protein** is Important: Spread Intake Throughout the Day.
- Take Your Time (and **plan ahead**).
- Take Time off your Diet: Re-feed, "Cheat," Toggle, *Etc.* (See [Section 4.5](#) on Cheat Meals).
- **"Get the Most from the Least."**
- **Plan Ahead** (to have enough time).

The above are to be kept in mind (and some are intentionally reiterated) when applying the more specific **Pre-Contest Dietary Strategies** below to help you know how to guide your Pre-Contest. Note that there may be **many exceptions** to these suggestions, but this is a **skeleton outline** that works quite well for many. Unlike the Off-Season, where Primary and Secondary Strategies seem to be more clearly prioritized, Pre-Contest Strategies seem to vary a bit more and **may even change for the same person**, from one Pre-Contest prep to

the next. Still, there is often an orderly progression (based on the idea of getting the most from the least) that one can follow, whereby certain **Initial Strategies** (such as removing junk food) would precede other measures (**Latter Strategies**) for losing body fat (adding formal cardio if one had not been doing so during the Off-Season).

- **INITIAL STRATEGY** Remember to **Get the Most from the Least**, making small, gradual changes to diet, activity and supplementation.
- **INITIAL STRATEGY** Assuming you've been eating to gain size (force-feeding to some extent) during the Off-Season, **simply cutting back** your calories to lighten this overfeeding stress, without experiencing significant hunger, will often induce some fat loss and a substantial amount of water loss. This reduction in body water is the relatively large scale weight drop that's very common at the start of your diet. How much you reduce calories initially will be a function of how much you've been eating Off-Season. An extremely large competitor who has been taking in, with great effort, a whopping 6,000 kcal/day can drop to a more comfy 5,000kcal/day easily and not risk muscle loss (see above). On the other hand, a 1,000kcal/day reduction from a 3,000kcal/day peak Off-Season intake isn't warranted in most cases. This initial strategy (if applicable) should have you looking considerably better, suffering no loss of strength, and not have your caloric intake dipping below approximate maintenance caloric intake, which ends up being around ~15kcal/lb/day for most(1805).
- **INITIAL STRATEGY** In conjunction with the above, reduce caloric Intake firstly by **removing “junk” food** and highly processed food if this is part of your diet. This, in and of itself (even if calories are replaced with less processed whole food), may also cause some loss of scale (water) weight, too [probably due to sodium content (1827) and inflammatory and insulin-resistance promoting actions of processed food(76, 1430, 1828)].

PRE-CONTEST DIET STRATEGIES

- 1 GET THE MOST FROM THE LEAST.
- 2 SIMPLY CUT BACK ON OFF-SEASON OVER-FEEDING.
- 3 REMOVE JUNK FOOD.
- 4 DON'T REDUCE & POSSIBLY INCREASE PROTEIN.
- 5 RETAIN INTRA AND POST-WORKOUT MEALS AS LONG AS POSSIBLE.
- 6 PLAN: CARBS AND/OR FAT TO CREATE YOUR CALORIC DEFICIT?...
- 7 USE HUNGER TO DETERMINE WHICH MEAL TO ADJUST AS YOU DIET DOWN
- 8 HAVE FUN & INCREASE "NEAT" TO EXPEND ENERGY.
- 9 LATTER STRATEGY: ADD CARDIO IF NEEDED.
- 10 LATTER STRATEGY: SAVE STIMS / FAT BURNERS FOR THE TAIL END OF DIET.

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- **INITIAL STRATEGY DON'T** change your Pre-Contest diet by sacrificing protein content. (This should only happen in extreme circumstances, e.g., when one might need to make weight and intentionally choose to lose muscle mass.) Instead, **increasing protein** might occur as a diet progresses, e.g. from 2.2g/kg to ~3.1g/kg and be sure to **spread your protein** out evenly throughout the day (called "protein pacing")(397, 1429, 1796), including using a **nighttime protein** source(387, 388, 399-402, 659, 1466).
- **INITIAL STRATEGY DON'T** remove calories from your Intra-Workout and Post-Workout meal(s) (about 4-8 hr post-workout). Retain this food intake as long as possible during the diet. The essentially means that most food would be removed from meals before or long after training (if time allows during the day) and on non-training days, whenever possible. Post-workout on training days, one should not be nearly as hungry as

on training days. One might also be hungry before workouts to some extent, but not if doing so severely impacts your ability to train hard. (I have found that, for many, simply starting to consume a PeriWorkout Recovery Supplement (see [Section 3.8](#)) just before starting to warm-up for a workout will take the edge off of hunger pangs and help with training effort.)

- **INITIAL STRATEGY DECIDE** whether you will **PLAN to drop carbohydrate AND/OR drop fat intake, as a DIETARY means for creating a caloric deficit**. The more food you can eat, and the lower your appetite [which is why some may prefer a low carb or cyclical ketogenic approach([1829-1831](#))], the better, as long as body fat loss is evident. Generally, both low fat and low carb diets work equally well for weight loss, at least in the obese/overweight([1832](#)), but genetic and other factors that explain why a given individual might fare better with a low fat vs. low carbohydrate approach remain mysterious([1833](#)). (See also [Section 3.7](#): There are data suggesting that those with poor insulin sensitivity may lose fat more rapidly by **reducing carbohydrate**, rather than following a low fat dietary approach ([540](#), [1449-1452](#)).] The bottom line here is **personal trial and error may be your best guiding light** in making this decision.] Obviously, you will likely reduce the content of both macronutrients in your diet to some degree, but be wary not to sacrifice: 1.) Protein for retaining muscle mass and 2.) Carbohydrate intake essential for refilling glycogen stores (although in the final stages of contest preparation, glycogen levels may wane). [Note too, that intramuscular lipids stores can be substantially reduced due to resistance exercise([549](#)), and that they contribute to muscle fullness/size. (See [Section 4.8 Peak Week](#) for more on filling up muscle triglyceride stores before stepping onstage.)
- **INITIAL STRATEGY USE Hunger and Meal Satisfaction (satiety in general and satiation of each meal) to guide** which meals you remove food from as you diet down. To some degree, this mirrors the common sense approach of using (gastrointestinal) biofeedback to guide when and where to add food to promote muscular gain Off-Season (see [Section 3.3](#)). In

other words, to minimize peaks in hunger, one would simply **remove fat and/or carbohydrate** (but not protein) from meals on **non-training days** and **outside the peri-/post-Workout Period** based on whichever of these meals 1.) Are the most filling and/or 2.) One is the least hungry for. This tends to mean changes are made to a **different meal each time** the diet is adjusted. (This strategy also tends to fit well with the **protein pacing** strategy noted above.)

- **INITIAL STRATEGY** As opposed to formal “cardio,” I have found that, whenever possible, a more life-giving and fun way to ensure the caloric expenditure Pre-Contest is to focus on increasing or maintaining your general activity levels, called **Non-activity exercise thermogenesis or NEAT**(678). NEAT would include things like using a stand-up desk at work, (re-)taking up active hobbies, being extra fastidious with housework, taking the time to walk to lunch, **walking your dog(s)** more often/for longer walks, *etc.* Typically, dieting will cause some metabolic adaptation (“slowing of metabolism”), especially as fat-free mass is lost(70), but the spontaneous activity of NEAT also suffers(1834) and may stay depressed after long periods of energy restriction(1835). In other words, your energy levels will be low when dieting, so you’ll feel a bit sluggish and tend to expend less energy over the day. Rather than combat this with formal (boring) cardio, why not include fun activities to take your mind off the humdrum of the diet, while also burning fat at the same time?... Estimating activity (accelerometry/pedometry) by monitoring **step counts** (e.g., with a **cell phone** or **fitness watch**) is a convenient way to track (and ensure) NEAT when dieting down(1836, 1837), as well. (Simply being sure that **one’s daily step count** does not drop considerably when dieting can be very helpful in keeping fat loss moving in the right direction.)
- **LATTER STRATEGY DO** consider whether you find that formal **cardiovascular exercise** (“cardio”) is beneficial for fat loss and plan whether and when you’ll use it (if at all). [The **Special Section** at the end of Chapter 3 on Cardio in the Off-Season covers the reasons do cardio (e.g., so one can eat more), what kind of cardio to do, and the potential incompatibility of cardiovascular

exercise with resistance training adaptation, i.e., that cardio runs counter to gaining and maintaining muscle mass]. Should you decide to use cardio to foster fat loss, you should also consider whether to do cardio in a fasted (postabsorptive) state. Many bodybuilders may find fasted cardio helpful Pre-Contest, perhaps because doing so upregulates enzymes of fatty acid oxidation(1838) and/or trains the body to spare glycogen during (cardiovascular) exercise(1839), which might have some carry-over in conserving this much needed fuel source during resistance exercise(546, 548, 549, 680, 681). On the one hand, a recent, well-structured study found that fasted cardio did not accelerate fat loss when dieting down (1840). On the other hand, many bodybuilders feel that morning (fasted) cardio **sets the tone for the day**, helping to establish regimen when hunkering down for Pre-Contest. Morning exercise **enhances mood** [as does exercise in general(1841, 1842)], although it may feel a bit harder at this time of day(1843), and can briefly inhibit appetite/enhance satiety (to varying degrees)(1844, 1845), perhaps even more so than doing cardio in the afternoon(1846). [Interestingly, breakfast before morning cardio may cause a bit of brain fog later in the day compared to doing “fasted” cardio(1847).]

- **LATTER STRATEGY** Do **hold off on using thermogenic supplements** (“fat burners”), especially those that are stimulants, as long as possible into your Pre-Contest prep. This falls in line with the principle of getting the most from the least. As many natural bodybuilders have demonstrated, **getting lean using very little in the way of OTC fat burners is possible**, so saving these supplements until later in your Pre-Contest prep ensures you can play these fat loss “trump cards” without risking **loss of effectiveness** from long-term use (and a major “crash” when removing them Post-Contest). For instance, in the case of caffeine, slowly ramping up use may prevent you from **rapidly becoming habituated** to its potential energy-boosting and ergogenic effects(936, 1848, 1849). [As a practical matter, I have found that **removing stimulant-based Pre-Contest fat burners one (non-training) day per week**, consuming only a small amount of caffeine (<100mg) in the way of green tea or coffee on that day, works well to maintain stimulant sensitivity, and precipitate a revitalizing nap

on those days.]

Pre-Contest Step #4: Ensuring Progress and Breaking Through "Fat Loss Plateaus."

There is no magical one-size-fits-all formula for applying the above **Initial** and **Latter** Strategies, as the principle of biological interindividuality fits here. However, plateaus in dietary progress can and do happen, and there are ways to address these as well, **all of which have been covered thus far** but are worth reiterating here:

- Apply the Pre-Contest Rule of Thumb to **“Take Time Off Your Diet”** (see [Pre-Contest Rules of Thumb above](#)). Sometimes, the single-minded focus we relish when deep into the Pre-Contest diet can make it seem like taking a week off the diet would be like “giving up.” However, dieting smarter can be more effective than dieting harder.
- Consider having a **cheat meal or refeeding period**, as covered in [Section 4.5](#).
- Call upon your dietary **“Trump Cards” – Those strategies you’ll only use sparingly and with reservation**. This includes the “Latter Strategies” of Step #3 above such as adding **extra cardio** or using (or increasing doses of) **fat burners**. It could also mean adding in **“Meat and Veggie”** days now and again, *i.e.* days that are typically NON-training days (when recovery demands are less) that follows the format/strategy of a protein sparing modified fast (PSMF)([1790](#), [1791](#)) whereby most of the calories consumed are from protein. (Note: Extreme amounts of cardiovascular exercise, while eating a protein-only diet is **not** generally advised!)
- **Re-evaluate** your life’s stresses, recovery strategies (including sleep) and ways you can increase NEAT (see above). (Are you being less active during the day because you’re tired, thus diminishing your caloric deficit and thus fat loss? Check the step counts (on your phone or fitness watch) and/or ask a non-dieting spouse, significant other or friend if they’ve noticed this if you’re not sure.)
- Don’t be concerned about eating late at night **per se**

(late night binging is not what I mean here): Consider shifting your food (and carbohydrate) intake to later in the day if this helps you sleep (see [Chapter 3 Special Section on Recovery](#)). Some research suggests that shifting calories and/or carbohydrate to later in the day may favor fat loss(1850), retention of fat-free mass(813), diet-related improvement in health markers(814) and improved nutrient handling aka "metabolic flexibility"(815, 1443). Don't forget to consume nighttime protein (typically micellar casein or a protein + fat source) to ensure protein synthesis overnight(399-401). (See [Section 3.2](#) for more on protein intake.)

Example of Pre-Contest Dietary Adjustments

Below you'll find an example of an end of Off-Season diet in the same configuration as the example used above ([Section 3.3](#)) for an [example of Off-Season dietary adjustments](#) in the Chapter above. As a refresher note the following:

- As with the Off-Season diet example, this diet is broken down simply into **training** and **non-training day** diets, which may not suit your training style (as noted preceding the example in Off-Season [Section 3.3](#) above). This is for the sake of having a simple, easy-to-follow example here and also fits well with my training system (Fortitude Training®). You may need to massage your Pre-Contest diet in **more sophisticated ways** (e.g., different prescriptions for each day of the week depending on both training load and habitual energy expenditure), but the same principles I've put forth in this Chapter would still apply.
- On the other hand, I've **intentionally NOT used the exact endpoint of the example Off-Season diet put forth in the previous chapter**. Instead, to provide a **slightly different starting point**, but **similar working model**, I modified that same Off-Season starting diet by 1.) Adding food to the peri-workout period and 2.) Switching the diet to what would be a "metabolic flexibility(1442)" approach (carbohydrate taken in at the end of the non-training days), as I put forth in [Fortitude Training®](#). [These are two main strategies that work quite well for gaining muscle in the Off-

Season, especially for those who find that adding carbohydrate is an easy and effective way to increase caloric intake.]

- So, the starting point of the diet below represents another (of many) **potential** Off-Season dietary endpoints a bodybuilder might arrive at when the Pre-Contest period starts. As many of you know, **each season and each Period** (Post-Contest, Off-Season and Pre-Contest) **can be different year to year** (by design or due to circumstances), so, for this reason, I use the below as the starting point of the Pre-Contest period (to give you the reader and coach a different dietary starting point to consider).

Table 17: End of Off-Season Example Diet (Training & Non-Training Days)

<u>END OF OFF-SEASON: TRAINING DAY EXAMPLE DIET</u>				
Meal Times & Examples	Pro (g)	Carb (g)	Fat (g)	Kcal
7AM <i>Example Meal:</i>	40	0	70	790
	3 whole Farm fresh eggs, 6 oz wild salmon, 2Tbsp X-virgin coconut oil			
11AM <i>Example Meal:</i>	40	0	70	790
	6 oz grass-fed sirloin, 4 cups spinach, 2 Tbsp Olive oil Dressing			
2PM <i>Example Meal:</i>	50	15	30	530
	Shake: 1 Scoop Protein Powder, 3 Tbsp Almond Butter			
Peri-WO: 4:30-6:30PM <i>Shake:</i>	60	170	0	920
	Whole Protein, EAA, Pro Hydro, Hi GI, easily digest. Carb source see Text			
Post: 7PM <i>Example Meal:</i>	80	260	0	1360
	3 Scoops whey "milk" with 9 cups rice crispies cereal			
Post: 9:30PM <i>Example Meal:</i>	50	200	0	1000
	6oz chx br, 1/2c onion, garlic Sauce, 1 bagel; 1/2 loaf Manna Bread w/ Honey			
Approx. Actual Totals	320	645	170	5390

<u>NON-Training Day EXAMPLE DIET - Metabolic Flexibility (More Aggressive)</u>				
Meal Times & Examples	Pro (g)	Carb (g)	Fat (g)	Kcal
7AM <i>Example Meal:</i>	40	15	70	850
	4 Grass-fed Beef Sausages, Veggie Stir Fry			
11AM <i>Example Meal:</i>	60	0	45	645
	4 Low Fat Chicken Sausages cooked in 1 Tbsp x-tra virgin Coconut Oil			
2PM <i>Example Meal:</i>	40	0	30	430
	Shake: 2 Scoop Protein Powder, 3 Tbsp Almond Butter			
4:30 PM <i>Example Meal:</i>	40	20	14	366
	Broccoli, 6oz wild Salmon, 1 apple			
7PM <i>Example Meal:</i>	75	200	0	1100
	3 Scoops whey "milk" and Kefir, 4 cups granola cereal			
9:30PM <i>Example Meal:</i>	50	200	0	1000
	6oz white fish, 1/2c on/garlic sauce, 1 bagel; 1/2 loaf Manna Bread w/ Honey			
Approx. Actual Totals	305	435	159	4391

Again, The below table summarizes **weekly adjustments** for an idealized/imaginary client in order to give you a simple example. (See the Example in [Section 3.3](#) for more on understanding this summary table.) In some cases, you might need to make adjustments more frequently, of course. As you would expect if you've been reading along the book, the diet uses a **nutrient timing** approach (large peri-workout caloric intake by way of intra-workout drink and post-workout meals), and these meals are kept intact, as long as possible during the Pre-Contest diet, whereas food (macronutrients) is mainly removed from other meals based on hunger (see Step #3 above in this [Section](#) for more on the Pre-Contest Dietary Strategies at work here). Additionally, this Fortitude Trainee is moving through

periods of **Progressive Blasting** and **Intensive Cruising** (a kind of deload/taper built into FT) (coded in green and yellow, respectively), which provides a kind of toggling to the diet and training (and the option to take time off the diet if needed).

[Abbreviations used: Wk = Week; BW = Body Weight; Skfd Tot. (mm) = Total of three self-selected skinfold sites. Perc. Recov. Status = PRS Scale Rating (see Chapter 2 Special Section on Overtraining).]

Table 18: Pre-Contest Dietary Adjustments Example.

Wk	BW	Skfd Tot. (mm)	Pics	Diet / Hunger	Strength	PRS (0-10)	Adjustments
0	232.7lb	27.0	Leaner than end of Off-Season	Hunger is stable	Increasing	9	Basic diet was unchanged previous 3 weeks, before starting Pre-Contest period but weight is down 2.1lb. Diet is "cleaned" removing occasional "snacks."
1	231.8lb	26.8	Water loss	Hunger increasing	Increasing	9	Snacks tended to be salty (chips). Non-Training day: Remove 1/2 cup Granola (meal #5), 1/2 bagel (meal #6)
2	228.9lb	24.6	Fat loss apparent	Hunger stable	Holding	7	As above, Removed 1/2c granola again (meal #5)
3	228.2lb	23.0	Ab veins coming in	Hunger increasing	Holding	6	Again, subtract 1/2c granola, as this meal is most filling on non-training days.
4	227.4lb	22.1	Glute "lines"	Hunger stable	Increasing on some lifts	7	Non-Training day: Remove 1Tbsp Almond butter, Meal #3
5	226.3lb	20.9	Harder look overall	Hunger increasing	Strength taking a Dive	5	Non-Training day: Replace 2 Breakfast sausages with ground chicken breast patties (+20g protein, -30g Fat); Training Day: Replace 3 whole eggs with 9 egg whites
6	225.8lb	19.9	Improved over last year	Hunger tolerable	Begin Cruise (10 days)	3	Weight is 5.8lb above pre-Off-Season start with same skinfold total!

[Abbreviations used: Wk = Week; BW = Body Weight; Skfd Tot.

(mm) = Total of three self-selected skinfold sites. Perc. Recov.
Status = PRS Scale Rating .]

Wk	BW	Skfd Tot. (mm)	Pics	Diet / Hunger	Strength	PRS (0-10)	Adjustments
7	224.2lb	18.8	"	Hunger increasing	1/2 week is cruise Training	8	Diet set up is the same, but fewer training days/week --> Fat loss + Recovery
8	223.6lb	17.9	Photo shoot ready	Hunger holding	Strength Improved	9	Continue with Diet, Use phone to count steps/Ensure NEAT. Non-training day: Meal #5: Remove 1 cup granola
9	222.9lb	17.0	Improvements apparent	Hunger increased	Strength stable	7	Add in Fat burners (low dose), Training Day: Remove 1 Tbsp Almond Butter Meal #3
10	221.2lb	15.9	Drying out	Hunger less	Increased	8	Fat burners have diuretic, appetite suppressant, and ergogenic effects.
11	220.1lb	15.0	Very Dry	Hunger up again	Stable	5	Training volume reduced slightly. Non-Training Day: Meal #6 remove 1/2 bagel, 1/4 loaf manna and all honey, add 6 oz whitefish
12	219.2lb	13.8	Getting really lean	Hunger is high	Start Cruise (1 week)	4	Cruise Training is same split, just 1 day/week less. NEAT is ensured with step counts by taking walks to keep them high (10,000+/day in this case).
13	217.7lb	12.2	DEXA: 5.8%	Hungry almost always	Stable (reduce volume, and rest intervals)	7	Show is 4 weeks out. Remove 2 cups rice crispies, add 1 scoop whey in post-training meal (7PM)

[Abbreviations used: Wk = Week; BW = Body Weight; Skfd Tot. (mm) = Total of three self-selected skinfold sites. Perc. Recov. Status = PRS Scale Rating .]

Wk	BW	Skfd Tot. (mm)	Pics	Diet / Hunger	Strength	PRS (0-10)	Adjustments
14	216.2lb	11.9	-->	-->	-->	7	Peak Week practice run: Typically results in quantum leap in conditioning.
15	215.5lb	11.1	Show Ready	Hunger replaced by excitement!	Maintenance workouts with safe exercises	7	Back to diet as of week 13 after a day of relaxed eating the day after peak week show day dry run.
16	215.2lb	10.9	-->	-->	-->	6	SHOW WEEK: TIME TO KICK ASS!

[Abbreviations used: Wk = Week; BW = Body Weight; Skfd Tot. (mm) = Total of three self-selected skinfold sites. Perc. Recov. Status = PRS Scale Rating .]

4.4 Keeping Hunger at Bay When Dieting (and Addictive Behavior)

Perhaps the greatest challenge of the Pre-Contest period is overcoming its effects on hunger, mood and, of course, one's desire to and ability to train hard enough to hold on to muscle mass. From an evolutionary biological standpoint, it makes sense that dulling our nutrient-seeking urges to offset the rigors of caloric restriction would not be an easy task. Still, the acquired knowledge of bodybuilders of yore and western science offers us **some tricks** to make dieting easier, and perhaps more importantly, more effective. Remember to apply the "get the most from the least" principle here as well: Too much appetite suppression can mean overly rapid weight loss, including loss of hard-earned muscle. Slow n' steady is the way to go here.

Before I proceed to the strategies for weathering the rigors of Pre-Contest dieting, I'd like to inject some perspective that relates to nature of what is essentially an extreme behavior that includes what might be considered (subclinical) disordered eating(1851).

The Elephant in the Room: Addictions & Psychological Disorders

If you are reading this book, you have very likely (as I have) recognized "extreme" or "addictive" features of your personality. These parts of your psychological make-up may very well be what have helped you with your bodybuilding success to date. However, this sword is double-edged, as addictive/obsessive psychological traits are not generally known as factors that contribute to overall quality of life (1852-1854).

You may be thinking, "Yes, Captain Obvious, get to your point." The point is that it's not uncommon for these tendencies to go into overdrive in the Pre-Contest pressure cooker. Sports and endeavors like bodybuilding with weight class restriction and a premium on limited body fat is most certainly a **risk factor for disordered eating** and eating disorders(1855).

If you have a previously diagnosed psychological disorder such as an addictive and/or obsessive-compulsive disorder, orthorexia, body dysmorphia, etc (1851, 1856), or simply suspect you do, please make your **social support system** (friends, family, significant other, etc.) aware of this as you diet down and/or consult with an appropriately **trained mental health professional**. *This may be one case where you simply cannot be your own coach*, just as a surgeon

cannot perform certain surgeries on him/herself. In the context of appetite suppression, please be especially wary of employing pharmaceutical solutions for appetite control [e.g., nicotine or kratom(1857, 1858)] that have the potential for addiction and abuse. From my perspective, bodybuilding is about improving your quality of life and life's experiences, not degrading them with injurious, self-destructive behavior.

Selected Strategies, Foods and Spices that may Decrease Appetite, Increase Satiety and Promote Weight Loss:

With the above caveats in mind, and keeping with the idea that the less stress one feels during dieting, the more effective and enjoyable the process, here are some thoughts, tips, tricks, foods and supplements (substantiated both scientifically and in the trenches) that may be helpful when **dieting** during the Pre-Contest Phase:

Develop a Perspective & Environment that Will Keep You On Track

- **Get the most from the least:** Use the below strategies only as needed. It's better to have several strategies that can still be employed (or exploited to a greater extent) as you diet down, than be out of strategies and not have yet arrived at contest day (with contest-level "conditioning").
- **Choose strategies that can be sustained** over the long haul of the diet (i.e., "crash" dieting strategies are to be avoided).
- **Be thankful for the opportunity** to diet down. Being hungry on purpose is a luxury that only the world's wealthiest can enjoy. Unlike those who are malnourished and starving due to life's circumstances, we bodybuilders have the choice to restrict food intake. Does it really make sense to complain about one's own choice?

KEEP ON TRACK

PRE-CONTEST

PERSPECTIVE AND ENVIRONMENT

GET THE MOST FROM THE LEAST



ENGINEER YOUR ENVIRONMENT
FOR SUCCESS



REMIND YOURSELF... WHY?..



- Realize that **this is not for the faint of heart**. Extreme physiques require extreme measures. To some degree, your willingness to endure is directly related to your success. When/if you have the desire to cheat on your diet (break from the plan set out, not necessarily have a planned “cheat meal”), remember that **you’ve chosen this path** and, while the point is not to torture one’s self, there is a general relationship between how hard you’re dieting and how good you will look on stage. In other words, it can be helpful to “step outside” (psychologically speaking) the hunger and discomfort you may feel (but don’t ignore what are obvious medical issues) and realize that to some extent, a difficult Pre-Contest period indicates you are on the right path. (I have never heard a bodybuilder who displayed an outstanding physique say the process actually “easy” or “effortless.”)
- Be aware that **environmental factors** that can affect your eating behavior(1859-1861) and do your best to **engineer your life** with this in mind. Recognize that food item packaging (when shopping) and presentation

[such as serving size(1862)] can easily affect your buying and eating behavior. You may need to be sure to **avoid shopping when you are overly hungry**, and be sure to **use a shopping list**. Many bodybuilders act proactively and remove tempting “trigger,” junk and snack foods from the house, or perhaps enlist a friend to hide/store them until after the contest when eating behavior is once again balanced.

- Similarly, you **will likely meet with questions, criticism and/or some other form of resistance** from people who feel uncomfortable with the discipline that you display and thus perhaps (subconsciously) might want to sabotage your efforts. **Recognize this before it happens** so you can be prepared to explain (or not) and **avoid entanglement with people who don't support your bodybuilding goals**.
- **Do fun things** when you're dieting down that keep you entertained (not agonizing over your next meal) and **enjoying life** and 2.) expend more energy via “nonexercise activity thermogenesis” (NEAT; see [Section 4.3](#) above).
- **Remind yourself – even by making a list of Pros and Cons** – of why you compete and put yourself and those you care about through the ordeal of Pre-Contest dieting. Be as honest as you can with this list. Con's would be things like grumpiness, missing out on family gatherings, holidays, and enjoying the companionship of a loved one in a way you wouldn't if you weren't hungry. If the Pro's are positive (e.g., you gain a perspective on how lucky you really are) or perhaps egotistical (e.g., you like being praised for your incredible physique), be **honest** and list these as well. **Simply knowing why you are doing this can be helpful**.
- **Write down reminders of the things that motivate you**. Are you preparing in honor of a lost loved one?... Do you relish the competition brought on by a cross-town rival?... (Would he/she cheat on the diet when you have the urge to, or would he/she eek out that last brutal rep at the end of a leg workout?...) **Know your sources of intrinsic (and extrinsic) motivation, rely upon them and call upon them when the going gets**

tough.

Dietary Tricks for Dealing with Pre-Contest Hunger

- Generally speaking, the most "filling" meals, i.e., those that increase satiety (during a meal) are the ones that most increase stomach volume (1863) (and are **not calorically dense**). Potentially having **more fiber** in a meal (a small effect which you may have to determine for yourself)(712, 877) can help here, too. Also, sodium(1864) (e.g., in the form of condiments, seasonings, etc.) and fat intake can both slow gastric emptying (1865) and help keep the stomach fuller longer, but choose wisely, as both of these **can come at a caloric cost, and overall, fat is poor macronutrient to induce satiety**(1866) (with the exception of when following a ketogenic diet – see below).
- For **gastric filling**, many competitors have success in keeping appetite at bay by including fibrous **veggies** (like peppers, spinach, spaghetti squash, broccoli, cauliflower, etc.) and of course, eating **salads** Pre-Contest. Also, being sure to drink lots of fluids (**possibly** including diet drinks – see artificial sweeteners below) and using **voluminous protein sources** like (highly scrambled) egg whites and sugar-free Jello® mix can help keep the belly full.

PRE-CONTEST DIETARY "TRICKS"

SAVOR YOUR MEALS:

- PREPARATION RITUAL
- CHEW!
- EAT SLOWLY
- ENJOY YOUR FOOD



PROMOTE GASTRIC FILLING:

- FIBROUS VEGGIES
- PLENTY OF FLUIDS
- FIBER SUPPLEMENT?
- (EGG WHITES)



USE WITH CAUTION / MODERATION:

- ARTIFICIAL SWEETENERS
- GREEN TEA, NUTS,
CAFFEINE



SPICE IT UP:

- USE SPICES AND
LOW KCAL. SALTY
SEASONINGS



EAT FREQUENTLY
WITH PLENTY OF
WHOLE FOOD
PROTEIN (FIRST)



© Scott W. Stevenson

- No/low calorie or sugar-free (**artificially sweetened** – see below) syrups, drinks, condiments, and toppings can also be used, but **be cautious!** These may help fix a “sweet tooth,” promote satiety and thus lower energy intake when dieting(878), but **anecdotally**, these can also perpetuate a sweetness or flavor fixation in some individuals (i.e., set one up to constantly seek out sweet and/or tasty foods and never really “settle” psychologically into the level of restriction that ultimately comes with Pre-Contest dieting). Long-term artificial sweetener use **may not** be an effective long-term strategy for keeping weight off(879-881), and might even derange normal physiological control of energy metabolism(882). I personally prefer to add flavor to **sparkling seltzer water** with a splash of lemon and/or stevia. [See also the topic of low FODMAP diet as a digestive health strategy (“P” referring to polyols which include many artificial sweeteners) in [Section 3.2](#) above.]

- I've previously noted in [Section 3.5](#) some foods/food components that can inhibit appetite (and thus counter weight gain): **Peppers**([868](#), [869](#)), **green tea**([869](#)), which can also be hepatotoxic([331](#), [1084](#)), **caffeine**([870](#)), **nuts and peanuts**([871](#), [872](#)). [Be wary of peanuts, which contain possibly problematic lectins([604](#), [605](#)).] I'll note also that **apple cider vinegar's health effects are controversial**([875](#)), and it may reduce appetite essentially by creating **nausea**([876](#)), which is not a strategy I'd recommend embracing to reduce appetite.
- On the other hand, using **salty seasonings** like taco powder, **garlic** salt and even ranch dressing mix (minus the sour cream) can add flavor to food with minimum caloric content. Generally, too, spices may improve cellular antioxidant capacity([334-337](#)) and digestive health (see [Section 3.6](#)).
- **Higher meal frequency** may([845](#), [1867](#)) reduce hunger (increase satiation over the long haul), especially when one sticks to a given pattern of eating([864](#)).
- **Take your time** when eating. Savor your food and the act of chewing and eating and the satisfaction that comes with it. Eating quickly is associated with obesity([1868](#)), insulin resistance([1869](#)) and the risk of type II diabetes ([1870](#)). The behaviors involved in initiating of food intake (beginning the meal and **meal-time rituals**) starts the process of satiation (being satisfied with the meal), and thus the satiety that would tide one over until the next meal([1871](#)). As it turns out, slow eating does indeed improve satiation and prevent the tendency to overeat([1872](#)), and more food "processing" (e.g., **chewing**, cutting into bite sizes, etc.) enhances satiation and satiety, in part by affecting gut-related hormones like cholecystokinin and glucagon-like peptide-1([1873](#)).
- **Ketogenic diets** (and ketones specifically) have anorexic (appetite-lowering) effects([1831](#)).
- Don't forget that **high protein** diets are satiating([361](#)). [Note that a true clinical ketogenic diet is not a high protein diet, *per se*([1831](#))]. In fact, some research suggests that eating your protein first (protein "preloading" your meals) may dampen your

appetite(865, 866) in a somewhat dose-dependent fashion (867) (the more protein, the greater the appetite suppression).

4.5 To Cheat or Not to Cheat: ReFeeds, Carb-ups, Calorie Toggling, Etc.

The original “cheat meal” was really one where you broke (“cheated on”) your own dieting rules: You went off the rails on your diet, throwing caution to the wind during an all-out food fest. Nowadays, the term may still mean that to some folks, but it can also mean simply a meal that a bit of an intentional trajectory off the beaten path of your normal, monotonous dietary grind. Some folks might refer to the same meal as a “**re-feed**,” as I do throughout the book, an “all you can eat (AYCE) meal,” or perhaps simply a “carb-up.” The “cheat meal” is typically one meal, but a re-feed may also refer to a more a prolonged period (several meals) of high calorie intake (ala a Ken “Skip” Hill “Skipload” – see www.teamskip.net) that fits into what’s sometimes terms a calorie “toggling” (back n’ forth) strategy. I’ve addressed taking time of the diet in both the context of the Off-Season ([Section 3.3](#)) and Pre-Contest ([Section 4.3](#)) already, but I’d like to dive a bit deeper into the psychology and physiology of “cheating” and whether “cheating” can actually make you “winner.”

In this Section, I’ll cover the Cheat Meal strategy in the context of the Pre-Contest Period, but I’ll simply note the obvious: Cheat Meals **can also be used to bump up caloric intake during the Off-Season**, for those who have a difficult time taking in enough calories, or want to be strategic and measured with the occasional dietary inclusion of **calorically dense calories** (e.g., from desserts, fatty foods, etc.).

Reasons to “Cheat” or “Re-Feed”

There are many reasons you might “cheat” or include a “re-feed” meal. First and foremost, a re-feed can simply be for sanity and balance during a diet: To give yourself a **psychological break** – a light at then of the week’s tunnel – and a way to balance out your life.

A cheat meal as part of a social outing can be a great way to maintain healthy relationships with family and friends (when the focus is on the relationships and not just the food).

Refeeds, when planned strategically, can also be a way to balance out the overall caloric deficit incurred by your diet and temporarily reverse catabolic and promote anabolic processes in skeletal muscle [via insulin and amino acids([563](#))]. This is also a way to **replenish muscle glycogen** that may have been reduced by

training(546, 591, 1874), especially if you're following a low carbohydrate diet or using some form of a cyclical ketogenic diet(1875). This is beneficial from both a performance standpoint(557) and because having low glycogen levels could diminish the anabolic response to resistance exercise(558-560). A strategically planned cheat meal/re-feed, if superimposed upon a diet otherwise strict enough to diminish them, can be a way to **maintain/restore training capacity** and thus the adaptive stimulus it imposes (helping with retaining muscle mass) when dieting down. The size and macronutrient content of the cheat meal might then depend on upon the:

- **Macronutrient Composition** of the diet otherwise, e.g., be higher in **carbohydrate** or even **fat**, which can be used substantially during resistance exercise(591) to restore glycogen and/or triglyceride levels if **relatively** more depleted.
- Be higher in calories (or be several meals long as with a Skipload – see www.teamskip.net for more on Skiploading) if the dietary restriction/deficit preceding the re-feed is greater.

Of course, the standard notion (hope) is that a single cheat meal will “boost your metabolism,” i.e., restore metabolic rate to higher levels and prevent what's called adaptive thermogenesis [the slowing of metabolic rate that occurs as we diet down(1876)]. As you may have noticed after a large meal (think post-feast sweats on Thanksgiving day), you do get an increase in metabolism due to what's called dietary induced thermogenesis(1877). However, most studies of overfeeding in general (where you'd expect an effect on metabolism even more so than after just one meal) suggest that there is **no magical metabolic** effect(1462, 1878, 1879).

It turns out that the extent to which excess food (energy) ends up as stored body fat is quite variable among individuals (as you likely knew), due to genetic reasons(183-185, 347) and other factors in the energy balance equation(1462). (Some of you feel like you could gain a couple ounces of fat just "driving by a pizza buffet," whereas others of you reading this probably have the sense you couldn't get fat to save your life!) Interestingly, a powerful determinant of whether or not you gain a lot of fat from overfeeding may also have to do with nonexercise activity thermogenesis (aka NEAT; see [Section 4.3](#) above) – the activity of fidgeting, moving around and expending energy during daily activities that you'd not really consider "exercise" per se(678). The lesson here is that **sloth**, as much as **gluttony** may be something to watch out for: Staying

active when engaging in cheat meals may be to your advantage when dieting down.

When and How to Re-Feed

So, you've decided on that some kind of re-feed strategy make sense, to "refill" both your brain and body, and perhaps allow for social gatherings where you're not pestered with incessant, annoying comments about your Tupperware.

Firstly, one should recognize that refeeding, although it may help with maintaining rates of fat loss overall (as well as how well one retains muscle mass), thus making dieting more "efficient", should be considered time taken away from dieting and should **be planned for**, as noted in [Section 4.1 Pre-Contest Dieting Rules of Thumb](#). A re-feed or dietary "toggle" could take on varying durations (and caloric configurations) ranging from:

- **Single re-feed/"cheat" meal:** High or low in Fat, of **known amount** or **free eating** ("AYCE" – All You Can Eat).
- **Short and Limited Multi-Meal** or **Specific Period of Time Re-feed** (typically < **1 day**): Free eating (ala Ken Hill's Skipload - see below) of varying macronutrient rules.
- **A weekend** (two days/week) strategy of increased carbohydrate intake([1801](#))
- **Several days** of *ad libitum* eating (**free feeding**) or eating controlled hypercaloric diet([1802](#)).
- Several days or weeks of a controlled diet, eating at/ slightly above maintenance (**time "off"**)([1804](#)).
- Varying combinations of the above.
- Note too that a using a **nutrient timing approach** as I proffer here in the book could loosely be considered a kind of "refeeding" strategy as well (and thus largely obviate the need for any other kind of re-feed.

So, whereas a short, single "cheat meal" re-feed will be only a small fraction of one's total Pre-Contest period, taking a week off the diet (e.g., for vacation or just for metabolic reasons) should be considered in the grand scheme of how long one's Pre-Contest period should last. This being said, what kind of re-feed strategy should one employ?

Include Protein, Load Up on the Carbs and Keep the Fat Under Control

Dietary protein is thermogenic(1880) and, as mentioned above, overfeeding protein does not seem to result in fat gain(98) probably in part because it increases metabolic rate(841). While overfeeding, in general, does not create a metabolic boost, some amount of research in humans shows elevated metabolic rate from overfeeding carbohydrate (348). More importantly, a carbohydrate binge may result in lesser gains in body fat compared to a calorically equivalent amount of fat, because of a greater increase in carbohydrate oxidation (453, 454) and metabolic rate that does not occur with a fat binge(455). Keep in mind that trigger foods(873) can sometimes be those yummy high glycemic index foods (think refined sugars here). Indeed, hunger 4 hours after eating is higher after a high glycemic than a low glycemic (equicaloric) meal(1881). Ghrelin, a hormone secreted by the gut that enhances appetite(1882), recovers more quickly during the hours after high carbohydrate meal (meaning hunger returns more quickly), whereas protein has a hunger-suppressing, fullness-increasing effect(1883).



In other words, additional fat does not elevate fat oxidation(1884), so excessive dietary fat is easily deposited as body fat(455). On the other hand, *de novo* lipogenesis (formation of “new” fat molecules from other substrate such as carbohydrate) plays a minimal role in human metabolism(1810). Some of this may be due to the acute effect of carbohydrate (but not fat) on elevating leptin levels(1885) and/or thyroid metabolism(1886). [An exception here may be omega-3 fatty acids, which may increase leptin sensitivity(502).]

How large and low in fat should re-feed/cheat meals be? Scientific evidence is scant when it comes to the effects of pushing caloric limits to produce muscle gain. One study found that going with a very low fat, (~7g fat per meal), high carb, high protein (1.5g/

kg/day) dietary approach actually led to more muscle mass(1887), and another study found that adding 350-450g of carbs per day roughly doubled gains in fat-free mass(1888), but these were daily caloric excesses, not intermittent cheat meals during an otherwise hypocaloric diet. Of course, fat is tasty, and there is a rationale for refilling intramuscular fat stores (546, 591) if you've been following a very low fat diet(573). Consuming a fatty cheat meal, when the overall dietary approach is effective (hypocaloric), is not an absolute "no-no." John Meadows (www.mountaindogdiet.com) has used a burger and fries cheat meal effectively himself and with clients, e.g., when/if body weight drops rapidly (in part simply as a way to provide a large caloric load. Ken "Skip" Hill (www.teamskip.net) is renowned for regularly (typically weekly) incorporating daylong fat-laden "Skiploads" in an otherwise regimented, and very effective diet structure.

Because of **my personal success** with (and the logic/scientific support behind) a nutrient timing approach (see [Section 3.8](#)), whereby **the post-workout period is essentially a "re-feed"** and non-training days often include substantial dietary fats [likely refilling intramuscular triglyceride stores(573)], I prefer to go on the safe side if/when applying a (additional) **re-feed meal** by sticking with a low fat approach. Typically, this would be something like homemade pancakes or sushi using low-fat fish sources, avoiding deep-fried options, and adding in a pint of sorbet for dessert. On the other hand, I've had great success in interspersing a week of eating at caloric maintenance [$\sim 15\text{kcal/lb/day}$ (1805)] every month or so, i.e., 2-3 weeks out of an entire Pre-Contest period. On a related note, I've often employed a "peak week" Pre-Contest practice run (as I detail in [Section 4.8](#)), which includes a **midweek carb-up** (~ 2 days long) more than once before during the weeks before a contest because it reliably produces a quantum leap forward in conditioning almost universally (and can be practiced repeatedly without majorly disrupting water homeostasis).

If one would simply like to taste fatty food (for psychological reasons), a potential **compromise** here is the use of medium-chain triglyceride (MCT) oil cooked at low temperature, as the fatty acids of MCT's have thermogenic effects, are metabolized more like carbohydrates and are less likely to be stored as body fat(519, 520, 522), but may also increase satiety(1889). (Butter flavored MCT oil is available!) Another option is extra virgin coconut oil, high in the medium-chain saturated fatty acid lauric acid(469) that has thermogenic properties(521, 1890).

If Eating Big, Keep Your Cheat Meal/Re-Feed "Short"

and include Plenty of Protein

Obviously, if you were to start cheating and continue to “re-feed” with **reckless abandon** for days on end, intramuscular stores of glycogen and triglyceride will be filled, and excess calories will be stored as fat. [However, a good deal of muscle glycogen (546, 1874, 1891) and even triglyceride(591) is used up high volume training, so even a very large cheat meal will not cause fat gain per se, simply because those macronutrients will be used to replenish diminished intramuscular stores.] At least in obese individuals, the tendency to eat larger amounts of calories is greater after high glycemic-index meals. [In one study, a high GI meal might mean >80% and >50% greater voluntary intake compared to a low GI and medium GI meals(1892). On the other hand, ensuring **high protein** in re-feed meals may be a way to increase satiety and control appetite(1880).]

Still, it's been demonstrated that leptin levels increase in parallel with the increase in BF% over a short period of intense overfeeding (a 10% increase in body weight over just two weeks) (1893). Because leptin's action is to prevent fat accumulation(1646), the correlation between high levels of leptin and high levels of body fat suggests that leptin insensitivity is associated with fat gain. Thus, if eating far above caloric maintenance, keeping your re-feed **short** or limited to a single cheat meal would then ideally prevent the development of leptin insensitivity.

Cheat When You're Lean

Refeeding simply makes more sense physiologically when you're lean. Leptin levels go down with exercise training that reduces your body fat (1894), and we know that leptin sensitivity is a function of blood leptin and insulin levels(1895). Leptin levels are also a surrogate measure for insulin sensitivity(1896), as you might expect. (See [Section 3.7](#) for more on insulin sensitivity.) The flip side here is that you will tend to lose less muscle mass when your body fat is higher(1813), so the restorative effects of a cheat meal are less likely to be necessary if you're not deep into you Pre-Contest diet (and very lean).

Harness the Cheat MEAL: Train Before and Afterwards

At the risk of repeating myself *ad nauseam* , it's worth noting that having an off-diet (e.g., AYCE) "cheat" meal just after a workout, especially one of your tougher sessions (such as a leg or back workout) simply makes sense from a nutrient timing standpoint

(1565). While the literature using untrained subjects is less convincing(396), a (high protein) post-workout cheat meal is perhaps more effective in trained subjects(937, 1584, 1585). [At the very least, this meal will ensure high protein consumption for the day, which is quite important for muscle hypertrophy(396, 1601).]

Another obvious advantage to those who have included large refeeds in their regime is they generally **feel better**, stronger, refreshed and restored afterward, especially after one's been dieting down for weeks on end. Thus, it makes sense to harness these effects to **help recovery** from the toughest training session (offsetting the rigors of your otherwise hypocaloric diet), and to train not long after a large re-feed to piggyback these restorative effects into a **great training session**.

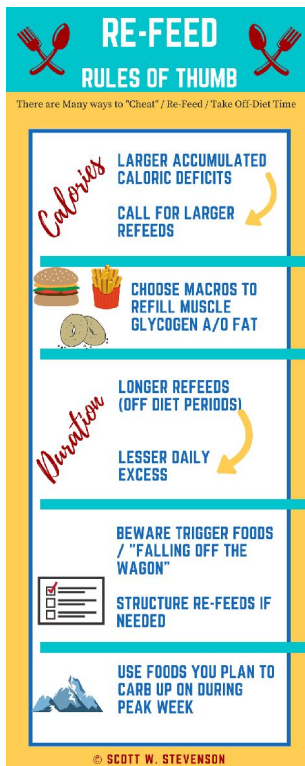
The Big Picture on ReFeeding

Keeping the above in mind (as I noted at the [beginning of this Section](#)) there are many ways to construct a re-feed strategy, ranging from a single "cheat" meal to several days of "eating up." (For some using nutrient timing, there may actually be no reason to include a formal "re-feed.") The overall size of the re-feed (total intake above habitual diet; food x meals) and or **duration** of the re-feed would generally vary inversely with the accumulated caloric deficit since the previous re-feed or the beginning of one's Pre-Contest diet. So, generally we can say that one could use the following to configure a re-feed:

- The **size of the re-feed** would be a function of the accumulated overall **caloric deficit**, and whether dietary progress during the Pre-Contest Period is on a **trajectory for being stage ready** on show day. The greater the accumulated caloric deficit before refeeding, the greater the re-feed can be (within reason). For example, a 500+ kcal/day estimated deficit over the course of 10+ successive days might call for several large re-feed meals if refeeding for only a day or several days of eating a caloric balance.
- The **foods/macronutrients** consumed during the re-feed would reflect the extent to which training (volume) and diet have **emptied intracellular storage depots** for carbohydrate (**glycogen**) and fat (**intramyocellular triglyceride**). For instance, if you've been dieting with a low carb, but relatively high fat diet, and training with high volume, then including less fat and more carbs in your re-feed strategy makes sense. On the

other hand [especially for natural male bodybuilders, for whom low dietary fat can impair testosterone levels (475, 529, 530)], if one has followed a low-fat approach, eating more fats in a re-feed makes sense for hormonal and fuel source reasons.

- The **period of time one plans** to re-feed would vary with the general rule in place: **The longer the re-feed, the less extreme the caloric excess** can/should be. (Single cheat meals can be large and extravagant, whereas days or weeks not in a caloric deficit should be much more metered.)
- **Psychological issues** with trigger foods, poor dietary adherence, disordered eating, *etc.* that might be set in motion, or even the abstinence violation effect(81-83, 1811, 1812) (see [Section 2.1](#)) by the stark divergence from the dietary norm that is a re-feed can sometimes be very problematic. (For some, refeeds simply must be **highly structured and metered**, using the same "re-feed" foods each and every time.) On the other hand, having periodic refeeds when dieting seems to help prevent Post-Contest bingeing that can result from many weeks/months of continually denying oneself culinary pleasure.
- Lastly, refeeds are an excellent way to include “off-diet” meals that one might use during a “



peak week" strategy to **carb-up** or even a **"shitload"** meal or two the morning of a show\, to fill out before going on stage. Including these foods periodically **during the diet** seems to anecdotally reduce **gastrointestinal issues** that can come about if abruptly adding them back after many weeks on a much stricter Pre-Contest diet (without these foods). See [Section 4.8](#) for more on Peak Week.

Personally, and with my clients, I often include a weekly post-workout "cheat meal" that includes some **social time** and is controlled, but deeply satisfying, i.e., favorite foods that one can enjoy in a social setting. For some, the break that comes with eating a tasty burger and fries meal once a week is psychologically worth it, even if physiologically this is not the best choice of foods for a re-feed. Others might find that a pancake spree (like my friend John Meadows) fits the bill. For those who are making excellent progress or even progressing too rapidly, and perhaps are not by nature a big (or binge) eater, a single "dirty" cheat meal of burger, fries, and a dessert (or something similarly sinful) may be a very tasty and convenient way to slow fat loss without orchestrating any other divergence from the pattern of one's dietary regimen.

When I have included a regular re-feed meal, I personally eat

the same delicious meal each time and only chip away at it if/when, in the last few weeks Pre-Contest, I still need to shed the last remnants of "stubborn" body fat (glutes and saddlebags in my case). For me, this meal has almost always been several "clean" (lean fish/not fried) sushi rolls (maki) and sushi (nigiri). I'll include some avocado (e.g., in a Rainbow Roll) and salmon (for the benefits of the essential fatty acids). Another favorite of mine is a cheese-free "personal sized" vegetable pizza, which I sometimes will need to de-fatten by denuding much of its sauce topping. This "pizza" then becomes a pseudo tortilla that I wrap it around pan-seared tilapia or chicken breast to make into tasty "Italian prep taco."

4.6 Pre-Contest Dietary Supplements & (Special) Foods

I have covered Supplements to aid in Fat Loss in [Section 3.6](#), as well as special foods and “tricks” to help deal with hunger in [Section 4.4](#), but would like to address the topic here, **more globally**. Generally speaking, supplements/drugs that are central nervous system stimulants (sympathomimetic, amphetamine-like, that, for instance, bind to and activate the adrenoreceptors) are appetite suppressing ([1897](#), [1898](#)), and thus can help with hunger during the last few weeks of Pre-Contest dieting. Unfortunately, the **supplement marketplace is a revolving door for these kinds of ingredients**, as they come and go the depending on the country of one's residence, and how fast **legislation** can catch up to the potential for harm and abuse [take, for example, 1,3-DMAA([1899](#))]. This is one reason why I suggest in [Section 3.6](#) that you consider developing and refining **your own dietary fat burner combo**, based on **raw ingredients** you can reliably, legally obtain. This will keep you from being at the whim of a “fat burner” supplement marketplace where product availability seems to come and go like the wind.

Unfortunately, there is good reason for this fat-burner phobia: Reports of adverse effects of caffeine-containing stimulant combo fat burners is on the rise, and one's vulnerability to such interactions may be unpredictable([1900](#)) and lethal([1901](#)). (This led to the FDA's stance on ephedra/*ma huang* in over the counter dietary supplements more than a decade ago– see below.) On top of a shifty supplement landscape, bodybuilders are often using surreptitiously-obtained prescription medications such as clenbuterol (a beta-receptor agonist) and tamoxifen (a selective estrogen receptor modulator), for the purposes of fat loss and appetite control([1902](#)), which may for instance, compete for the same detoxification enzymes in the liver, thus changing their pharmacokinetic profile in unpredictable ways([1245](#), [1903](#), [1904](#)).

There are plenty of books and other resources describing the effects if illicit/banned agents used for fat loss (see [Section 7.2 Resources](#)). So, rather than further, indirectly encourage their use by describing them and their mechanism here in detail, at the risk of disappointing some of you reading and creating legal liability for myself, I've chosen to mainly focus on many strategies for fat loss throughout the book. (Again, please see the end of [Section 3.6](#) for a list of “Fat Burner” supplements.) In this context, it's worthy to note that many (tested) **natural competitors can get very lean** (as lean as non-drug tested competitors), but, in my experience, typically tend to

be very meticulous Pre-Contest, typically dieting for more extended periods of time in an effort to retain as much muscle mass as possible (7, 475, 679, 1905).

For the sake of your edification, I would like to mention ephedrine [a component of *ma huang*/ephedra(1901)], in light of the body of literature supporting its utility for fat loss. [Please note that ephedrine and herbal ephedra are **not** legal for sale in the United States for this purpose(1906, 1907).] In combination with caffeine, **formal studies of ephedrine** have shown promise experimentally, as it activates brown fat thermogenesis in lean individuals(1908), possibly via the β -3 adrenoceptor(1909) and when taken orally, speeds fat loss and helps with preservation of fat-free mass(1024, 1910, 1911). Many of you have probably tried ephedrine, is surveys and hair analyses suggest is a staple in many iron athletes' fat-loss arsenals(1912, 1913). On the open market, ma huang containing supplements do run a risk of adverse events(1901) and abuse(1914), but clinical trials have found it to be generally safe in obese subjects(1915) and does not seem to be associated with serious cardiovascular events when prescribed by medical professionals(1916).

Chapter 4 SPECIAL SECTION: Essential and Branched Chain Amino acids – Scam or Ace in the Hole?

Have you ever thumbed through a bodybuilding magazine and barely been able to pick out the articles between the pages and pages of ads? Well, there's a reason for this, of course. Bodybuilders and fitness enthusiasts have an unquenchable thirst for an edge, any edge, we can find. This also makes us **easy targets for marketing ploys**, even the bad ones. The more exotic and “shiny” the supplement, the better it oftentimes sells (before fizzling out in most cases).

There are exceptions, however. One of the simplest of all supplements, free-form amino acids (AAs), nowadays sold typically as just the branched-chain amino acids (BCAAs) or all the essential amino acids (EAAs), are a **long-time survivor of the muscle-building supplement jungle**, so I felt the need to dig into this topic a bit. Given that **AAs are nothing more than the building blocks of protein**, this is really quite astounding when you think about it. One would think that there must be **some advantage** in consuming amino acids versus eating them as food or just sucking down a less expensive protein powder shake. So, the question beckons: **Are free form AAs really something special, an ace in the hole for the hard-working bodybuilder, or are they one of the greatest supplement scams in the history of bodybuilding?**

Science tells us volumes about the metabolic effects of amino acids, but given how they're typically used, a surprisingly large number of the practical, hands-on questions are still missing clear answers. In the first part of this Special Section, I'll take a closer look at how supplementing with BCAAs and leucine, in particular, and the other EAAs impacts the bodybuilder's most precious commodity, skeletal muscle. I'll also focus on whether it matters if you consume **just the BCAAs**, rather than **all the EAAs together**. In the second part of this Special Section, it's down to brass tacks and an examination of the ways EAAs are often used: When **dieting for fat loss** (e.g., before cardio), **between meals** to further anabolism, and/or to **supercharge the anabolic effects of food** and protein supplements themselves. The question here will be whether, from a scientific perspective, supplementing with EAAs is **money well spent** or more so **money down the drain**.

<u>Amino Acid</u>	<u>Group(s)</u>	<u>Abbrev.</u>
Leucine	BCAA, EAA	Leu
Isoleucine	BCAA, EAA	Ile
Valine	BCAA, EAA	Val
Lysine	EAA	Lys
Methionine	EAA	Met
Phenylalanine	EAA	Phe
Tryptophan	EAA	Trp
Threonine	EAA	Thr
Histidine	EAA	His

Table 19: The Branched Chain/Essential Amino Acids.

All Amino Acids are not Created Equal

As bodybuilders, we're mainly interested in the AAs used for building muscle protein (the "proteogenic" AAs), which can be roughly categorized into those our bodies cannot produce and thus must be consumed in the diet (the **essential** amino acids; see Table above), and the "**non-essential**" AAs, consumed with food as well as produced by our bodies. Among the EAAs, the branched chain amino acids (leucine, isoleucine and valine), so named because their structure(643), have been a bodybuilding supplement staple for decades.

BCAAs: Anti-Catabolic, but Still Lacking...

It would be an unforgivable sin to limit muscle growth because of a lack of building materials in the way of protein. The BCAAs are especially important in this regard because they make up nearly 1/6th of skeletal muscle protein (as well as more than 1/3rd of the dietary EAAs)(1917-1920). Exercise increases the oxidation of the BCAAs in particular(1918, 1921) to serve as substrate for gluconeogenesis(1922), and the fitter you are, the greater your ability to do so(1923, 1924). Even worse, if you're doing "fasted" morning cardio sessions while on a low carb diet, you're likely exacerbating things. Low muscle glycogen further activates the key enzyme of BCAA breakdown in skeletal muscle(1925) and the faster you oxidize fat, the faster BCAAs are broken down as well(1921).

As it turns out, supplementing with BCAAs does indeed reverse the unwanted oxidation of the muscle BCAAs(1926), and even enhances fat oxidation(1927). And, as you might expect from that, BCAA supplementation also reduces postexercise muscle soreness and damage(1928, 1929). However, presenting only the BCAAs may only marginally increase(1930) or even decrease myofibrillar protein

synthesis((1926), as well as breakdown, such the overall protein balance is largely unaffected(1931). The **less than impressive impact of the BCAAs** on overall skeletal muscle protein metabolism may be due to competition between the three BCAA's for transport, i.e., such that leucine's anabolic actions are diminished by valine and isoleucine(1931).

Leucine: King of the EAAs?

Leucine is often touted as the standout among the BCAAs: It's been repeatedly demonstrated to be a potent trigger of muscle protein synthesis in rodent studies, in particular by affecting a major player in intracellular anabolic signaling known as mammalian target of rapamycin (mTOR) (373, 1918, 1932, 1933). Leucine does indeed activate mTOR and other mediators of protein synthesis in human muscle as well(378, 1934, 1935), and leucine administered alone is both anti-catabolic(1936) and anabolic(1937, 1938). In fact, leucine by itself brings about many of the same metabolic effects as administering all the BCAAs together (1939), but the details of leucine's **individual prowess** in directing muscle-building in humans are surprisingly scarce(1936). It seems, though that the effects of leucine on resting-muscle protein synthesis are saturated(1595, 1940) in amounts equivalent to that found in roughly ~20g(362, 363) to ~40g **dose of a high quality [e.g., whey or beef(439)] protein(364-366)**, sometimes referred to as the "leucine threshold(1601)."

On the other hand, if supplementing with the BCAAs, it definitely makes sense to at least keep leucine's little brothers, valine and isoleucine, in tow(1941). Administering leucine alone actually stimulates the catabolism of the other two BCAAs(1921, 1942), potentially reducing their availability(1943) in a muscle-gaining/muscle-retaining scenario. A very recent study comparing a substantial whole protein dose (~45g for a 220lb bodybuilder) versus (only) the amount of leucine (~5.1g) found therein. Leucine turned on some, but not all of the anabolic signaling stimulated by whole protein, but failed to have any effect on protein synthesis (1944).

Worthless or Worthy: The "Other" Essential Amino Acids?...

Study after study has demonstrated the positive effects of an **EAA blend** (~6 grams or more) on protein balance after a weight training bout(154, 1574, 1579, 1937, 1945-1949). **These effects are**

not improved upon by adding non-essential aminos into the mix(1947, 1950), whereas adding EAAs or leucine back to a suboptimal protein dose improves the anabolic response(383). This makes sense: The necessary (essential) players in the hypertrophy game, **the EAAs "should" be present before your muscle cells have the go-ahead to kick off protein synthesis** . However, are the non-BCAA EAAs – **the “other” EAAs** – real players here, stimulators of protein synthesis themselves, or are they merely **cheerleaders** in the muscle-building march to the goal line?

The effects of the "other" EAAs accidentally came to light as a prominent group of researchers in this area were testing out different amino acids "tracers" used to quantify muscle protein synthesis. [More amino acid tracer incorporated into muscle protein means faster protein synthesis (1951).] A methodological concern to some degree(1952), it slowly emerged that not only leucine(1938), but also valine(1953), and the non-BCAA EAAs phenylalanine and threonine(1954) each increase protein synthesis independently. As expected, though, the non-essential amino acids have no such effect(1937).

Using isolated mouse muscle to take a closer look at what's going on inside the cells, these same researchers confirmed that the non-BCAA EAAs turn on the intracellular engines of protein synthesis, and that leucine is indeed the quarterback of anabolic signaling inside the cell. However, in isolated mouse muscle at least, the other BCAAs (isoleucine and valine) were not overtly anabolic in nature(373). [Indeed, men are not mice, and these results may help explain why rodent and human studies of the BCAAs' **anabolic** effects are puzzlingly disparate(1936).] While BCAA-only supplement does increase postexercise myofibrillar protein synthesis (1930) compared to a placebo, it does not do so to the same extent as EAAs do(438) or whole protein (containing a complete complement of EAAs)(363, 383). It seems those **“other” EAAs do have an important role**.

So, what's all this mean?... Well, in a situation where the availability of **non-EAA amino acids might be limiting** (e.g., in the morning after a night's fast when you've been Pre-Contest dieting or if you've somehow missed a meal), EAAs still turn in myofibrillar protein synthesis, but **cannot sustain it like a whole protein source would(383)**. All in all, a solid anabolic AA “cocktail” would include **all the BCAAs** [for structural(1917) anti-catabolic(1926, 1936) reasons] on top of **the “other” EAAs**, mixed with **the non-essential AAs**, which is essentially what you find in a complete, food-based protein like whey or beef(364-366). (See also [Section 3.2](#) for more on protein quality and timing.)

So, Can/Should I use AA Supplements?

Although the details haven't been worked out, all of the EAAs seem to have potential to promote muscle anabolism and prevent breakdown. **Given this, it seems that if you're using the BCAAs for the purposes of claiming new or retaining old muscle, you might as well use all of the EAAs (if not a complete protein source).** This really shouldn't be terribly surprising considering the EAAs are indispensable components of bodybuilding's most prized possession, muscle protein. Nonetheless, this still doesn't justify using EAAs over, for example, beef or a whey protein isolate, both of which also contain all the EAAs (1955).

Below, I'd like to take a stab at the conundrum of whether an EAA supplement really has any advantage over whole proteins containing those same EAAs. In particular, I'd like to dig in on whether there's strong scientific support for any of three of the primary ways that EAAs are employed in bodybuilding: When dropping fat, between meals, or to amp up the muscle-building action of the protein you're already eating.

Aminos as Anabolic Instruments

If you read the this Special Section up to this point, you probably don't doubt that the essential amino acids (EAAs) do good stuff when it comes to muscle mass. The branched-chain amino acids (BCAAs) are anti-catabolic, leucine reigns as king of the amino acid mountain, and the other essential amino acids each have anabolic properties unto themselves. However, given that you **eat** amino's every time I have a protein-containing meal or a shake, why would you supplement with them?" Here are the reasons I've seen put forth as to why one would use EAAs (as leucine alone, all the BCAAs and/or simply an EAA blend):

- To **prevent muscle loss when dieting.**
- To maintain positive protein balance **between meals.**
- To **boost the anabolic kick** of their food/supplements.

Precision Anabolism: Keep the Muscle, Lose the Fat using EAAs?

When it comes to the EAAs and signaling anabolism, a little goes a long way. Scientists have long used EAAs as low calorie, anabolic/anti-catabolic "mini-meals" that avoid the exercise-related

gastric difficulties that consuming a larger amount of protein in a regular meal might cause(816, 1956). Only 6 grams of EAA (typically with ~35g carbohydrate) is enough to substantially shift muscle protein balance when consumed before, during and/or after a resistance exercise bout(1574, 1579, 1587, 1957). As little as 7g of BCAA is enough to reduce muscle soreness and muscle damage after a squat workout(1928).

Additionally, we know that the faster you spike blood amino acids, the better, if you're looking for a rapid effect on protein turnover(368, 400, 1957-1959). Outpaced only by di-and tripeptides(832, 833), free-form amino acids are rapidly absorbed because they need not be hydrolyzed from an intact protein source. Consuming individual amino acids peaks their blood levels in approximately 30min(1960), twice as fast as even a whey protein(400, 1957), and generates a higher peak than after a whole food meal(1961). In fact, an oral EAA supplement stimulates protein synthesis just as well as infusing those same EAAs(1962).

So, **theoretically**, using EAAs (and especially BCAAs) during a **fat loss diet** should be helpful for retaining muscle, due to their effects on muscle metabolism (see above), and for losing fat, by **sparing the extra calories of a whole protein source or a full meal**. This seems entirely possible, given that a **small protein-containing recovery supplement (small enough to not even affect overall macronutrient or caloric intake) consumed just before and after a weight-training workout can boost muscle gains over the long haul**(1639, 1963). Does the same hold up for supplementing with EAAs before cardio, for instance, when your goal is losing body fat? More specifically, does timed EAA consumption hold any advantage over food or a simple protein supplement during a long-term fat loss scenario?

As it turns out, **the kinds of studies that apply directly to what bodybuilders are doing with EAAs are scant, to say the least**. During a 3 week trek at altitude, taking a BCAA supplement three times a day (~14g daily) helped hikers retain muscle mass and power(1964), which suggests that regular BCAA supplementation can indeed generate an **anti-catabolic effect** that adds up over time. However, mountainous hiking is a far cry from bodybuilding. In a study published only in abstract form(1965), a total dose of 9g BCAA (4.5g before and after training) had no effect on strength or fat-free mass. (Fat-free mass was, perhaps because they studied previously resistance-trained subjects, not increased over the 8 week training period in either the BCAA or the placebo group.) One study of wrestlers examined a “gradual” (for wrestlers anyway) weight loss approach during pre-season conditioning(1966), a **strategy with**

goals similar to those of bodybuilder: Keep the muscle and lose the fat. Unfortunately, the study may have generated more questions than answers. Taking a daily, supersized BCAA supplement (~63g BCAA, mostly from leucine and accounting for more than 50% of daily protein) helped those wrestlers **lose more body fat**, but did not affect muscle mass retention compared to their teammates consuming a high protein or high carb diet with equal calories. So while the anti-catabolic effect of BCAAs I discuss above was not observed, it's possible that such muscle **sparing** effects were not apparent because **none** of the dietary conditions resulted in a substantial (>~5%) loss of muscle mass. The BCAA and high protein diets actually caused greater reductions in thyroid hormone over the 19-day diet, possibly because these diets were *de facto* low in carbohydrate(1967). The BCAA diet also enhanced the growth hormone response to exercise. Indeed, BCAAs have been shown to elevate postexercise growth hormone levels(1968), as well as improve lactate threshold(1969), the latter of which would permit more vigorous training. Both of these effects could have accelerated fat loss in the BCAA group in this study(1966). Nonetheless, the lack of effect on fat-free mass in this study certainly **doesn't provide a rock-solid real-world demonstration of the highly touted muscle-retaining magic of BCAAs.**

A more recent study seemed, on the surface, to provide hope for BCAAs as a way to retain muscle when dieting(1970). While the study did report greater retention of fat-free mass during 8 weeks of resistance training in a caloric deficit (7g BCAA both before and after exercise), in examining the data, it is clear to me and others(1971) that the results are suspect, especially in practical value. For instance, the study's authors claimed a statistically **greater** fat loss in the BCAA group, although the BCAA group only lost **0.6kg** of fat compared to **1.4kg** in the placebo control given a carbohydrate placebo. (Here's an example of why reading past an study's abstract is vital to contextualizing its findings.)

Keep the Mojo Workin' with EAAs Between Meals?

Spacing out the day's food into small, frequent meals is nearly dogma in some bodybuilding circles, either Off-Season or Pre-Contest, and this fits with the strategy of protein pacing(397, 398, 659, 1429, 1796, 1972), which I've covered throughout the book (e.g., [Section 3.2](#)). Is there reason to believe we could intersperse **EAAs between meals** to keep our muscle building mojo working full time?

Bathing skeletal muscle with EAAs does of course stimulate protein synthesis(1946), but unfortunately, it seems that both

human(1937, 1973) and rodent(378, 1974) muscle become resistant or “refractory” to protein synthesis after the initial effects of a meal, sometimes referred to as the “muscle full” effect [a kind of “proteinstat” homeostatic mechanism(380)]. In other words, despite continuously providing amino acids, some research suggests that protein synthesis will nonetheless slowly grind to a halt. This is problematic because a typical mixed macronutrient meal may still be feeding AAs into the bloodstream for longer than 5hr(1975). We do know that a dose of EAAs still has an effect even if consumed an hour after an initial postexercise supplement(1950, 1976), but information is limited as to what happens during the hours beyond this, as well as just exactly how a previous training session affects this refractory phenomenon. We know from the effectiveness of the **protein pacing** strategy that there is hope, of course, and as it turns out, the muscle full effect may be overcome with feeding more leucine [possibly by counteracting a decrease in intracellular EAA concentration(405, 1977)] or carbohydrate [probably by restoring energy status(381, 382)]. Similarly, while using EAA’s or a leucine-enriched protein source, a very small dose (6.25g) may transiently spike protein synthesis, but the effect does not persist(383), perhaps because non-essential amino acids become limiting. So, this brings us back to why consuming a whole protein source between meals (not just EAAs) fosters greater muscle growth(392).

Still, it is worth noting that it’s not the blood AA levels *per se*, but rather the **rise** in blood AA levels – just as an EAA supplement could accomplish(1960)) – that seems to be the important trigger for skeletal muscle protein synthesis(1946). This wouldn’t be the first time that bodybuilders had employed strategies to grow muscle long before they were tested and validated by rigorous research. Hopefully, more direct study of the potential anabolic effects of intermeal EAA/whole protein dosing will bear this out, but for now, it seems like a whole (EAA rich) protein source (with enough dietary caloric energy) is the surest way to get the full anabolic benefits of protein.

EAAs: Turning Protein into SuperProtein?...

So, one more looming question remains: Is it possible to “**amp up**” the **anabolic potential of our diet** by adding EAAs (or simply leucine) to meals and supplements? Certainly, this might be a feasible option for a vegetarian (if the animal origin of some EAA supplements is not irreconcilable), but would it matter for your typical carnivorous, whey protein-slugging bodybuilder? Indeed, the science tells us that it’s the EAA content of a protein source, not the non-essential amino

acids, that is most important for positive protein balance (1601, 1947, 1950). Also, adding leucine to food may even increase insulin secretion(1978). So, given the bodybuilder's motto that "more is always better," the answer is obvious, right?... (Well, let's dig deeper anyway.)

It seems that, meal by meal, the scientific findings in this area are, as you might have guessed by now, less like clues and more like riddles. Research has demonstrated that EAA and whey protein supplements each enhance protein balance when consumed at rest (no exercise)(1979) or following a resistance exercise bout(1980), but found that increasing the leucine content of said supplement does nothing to further this effect(1979, 1980). One study with **older subjects** also found that adding leucine to whey was useless after exercise(1981), whereas another study found that 4 extra grams of leucine added to a suboptimal (24g) protein serving increased postexercise MPS in both the young and old(1600). Other evidence **with the aged** tells us that enriching an EAA supplement(1982) or the entire diet(1983) with leucine improves protein synthesis, at least when exercise is not involved(1984). However, older folks often display "anabolic resistance," a diminished anabolic response to protein and/or resistance exercise(428, 429, 1595, 1985), which may be inactivity related(430, 431). To further complicate the issue, extra leucine in your EAAs may actually enhance intracellular anabolic signaling, but **still** not result in a marked improvement protein synthesis(1979), except, perhaps, if it's following a cardio session(1986).

Investigations of the **long-term anabolic effect** of adding EAAs to the diet have likewise focused on leucine, but the studies are few, often employ only paltry doses(1941, 1987, 1988), and again, give us mixed messages. In hard-training track and field athletes, 3.8g of leucine per day may be enough to prevent a decline in blood leucine levels, but does zilch for performance or to prevent testosterone from falling(1989). In older subjects who were either sedentary (7.5g leucine/day with meals for 8 weeks)(1990) or resistance training (12g EAA/day post-workout for 12 weeks)(1991), EAAs enhanced neither body composition nor strength. **On the other hand**, young novice weight trainees (4g/day)(1992) and competitive canoeists (~3.3g/day)(1993) got stronger and improved rowing specific power and endurance, respectively, simply from adding leucine to their diets. [As a side note: This effect is surprisingly similar what has been found when the infamous leucine metabolite beta-hydroxymethylbutyrate (HMB) has been studied(975, 978).] Relatedly, a recent study found that using a **hydrolyzed whey source** (30g; presumably containing free form amino acids as well as di-and

tripeptides) peri-workout and on non-training days **promoted fat loss** [possibly via the sympathetic nervous system([1594](#))], but not muscle gain([835](#)).

Studies with higher daily doses of leucine and EAAs paint a likewise schizophrenic picture. Adding 12.4g leucine (along with ~40g of protein) to the daily diet improved bench press strength and body composition in a study of volunteers, **some** of whom were weight training on their own([1994](#)). On the other hand, 6 weeks of formalized resistance training and aerobic training failed to improve body composition or strength in **any** subjects in another study, whether consuming EAA (18.3 g/day) or a placebo([1995](#)). In another experiment where subjects only trained bench and leg press, 20g whey + 6.2g leucine taken 30 min before and immediately after exercise was useless for promoting gains in strength or fat-free mass([1996](#)). However, a nearly identically-timed supplement regimen (using 14g protein blended with 6g EAA) and a **full** body training routine essentially doubled gains in bench and leg press strength, as well as fat-free mass and thigh muscle mass, when compared to a control group([1963](#)).

And When the EAA Powder Has Settled....

EAAs, especially the BCAAs, are aged veterans of the supplement market, and certainly demonstrate anabolic and anti-catabolic actions. This very longevity, the available science, and personal experiences are enough to warrant their use in the eyes of the many bodybuilders. Nonetheless, we're still missing a solid collection of practical, hands-on experiments showing that EAAs outperform and/or improve upon the effects of a well-conceived diet, constructed from "good old food," complete proteins, or simply a high quality protein powder. Evidence that supplementing with EAAs or leucine alone is ineffective a **complete** set of building materials in the form of whole proteins themselves may also be necessary([383](#), [1941](#)), which makes sense from an evolutionary perspective. As a concrete example of getting a bit silly with supplementation, in the study of pre-season wrestlers mentioned above ([1966](#)) where a whopping 63g (approx.) BCAA supplement failed to have any anti-catabolic effect, the rest of their daily protein intake totaled a paltry ~22 grams! (Perhaps the BCAAs were indeed exerting an anti-catabolic effect that was counterbalancing the protein deficiency of the diet...)

**ESSENTIAL AMINO ACIDS
(SCAM OR ACE IN THE HOLE?...)
WHEN / HOW TO USE?**



**Combat Anabolic
Resistance: Add EAAs?**

**Supplement Suboptimal (small /
low quality) Protein Sources?**

Peri-Workout?

If whole protein eaten just Pre-Workout...

Bridge Two meals (when whole
protein not available / convenient)?

**Overall Diet is Low in
Protein / EAAs?**

**Dietary Energy is Low /
Hypocaloric?...**

Recovery levels waning?

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You are probably already regularly consuming a large amount of animal-based proteins and protein powders (1997), an abundance of essential and non-essential amino acids via whole protein(403), and very possibly enough in each meal to maximally promote anabolism and retard catabolism in skeletal muscle(362). **More may not be better and could even be worse.** Chronically consuming excessive BCAA or leucine intake may actually promote muscle loss by

upregulating BCAA breakdown: A recent study of rats found that BCAAs and leucine still promoted protein synthesis acutely (as we see in many human research studies – see above), but rats consuming a diet where 10% of a standard rat chow was replaced with **leucine actually lost muscle mass** in some of the muscles studied, presumably due to elevated BCAA catabolism(1998).

Indeed, it does seem like there may be some (albeit ill-defined) long-term effect of supplementing the diet with EAAs and leucine when it comes to strength and muscle mass, especially in cases where **protein intake overall is inadequate**(1601), which is, of course, **ideally this not the case for you**, Coach. Perhaps effective strategies for employing EAAs exist somewhere between these extremes or in special circumstances, such as when **dietary protein is predominantly plant-based** with little variety(440), when a **real meal or even a protein shake cannot be consumed**, or when **cutting calories to ridiculously low levels** before physique competition. Fortunately for the faithful users of free-form amino's, it seems that high EAA intake (1921), like protein intake(1999), is relatively safe. So, in lieu of clearly negative or harmful side effects and perhaps even regardless of whether science ever clearly answers the questions I've put forth here, I suspect that EAA supplements will retain a secure position in the marketplace for quite some time, firmly entrenched as an ingredient in the bodybuilder's supplement cookbook.

Given the above evidence, how and if one might make use of the anabolic potential of EAAs would probably vary along a contextual sliding scale depending on, but not limited to:

- Biological Interindividuality: Person (age, general activity level, muscle mass).
- Physiological State/Nutrient Timing: Recency of last resistance (and other) exercise sessions.
- Physiological State/Nutrient Timing: Recent training session parameters (volume, intensity, muscle mass) of one's current training program.
- Diet/Nutrient Timing: The timing and amount/constituents of one's last protein dose relative to EAA supplementation.
- Diet: Quality (EAA content) or protein in one's diet, in general.
- Diet: Total intake of protein.
- Diet and Physiological State: Total energy intake/

energy balance.

- Physiological State: One's current overall state of Recovery (see Chapter 2 Special Section on Pushing the Envelope).

4.7 Presentation: Posing, Tanning & Being Ready For the Big Dance

Posing and Presentation

I have covered presentation and posing practice in [Section 1.3 Common Goal #3](#) (at the end of the Chapter). Even if your goal is not to improve your presentation, per se, practicing your posing during the year (even in the Off-Season) is something I'd suggest. Impressive posing is cultivated over the course of many, many years and only through thorough, formal posing. If not formally, actively trying to improve your posing (at any time of the year), **one can fall prey to the dangerous pitfall of practicing poor posing**, devoid of transitions and stage presence that presents your physique in its best light on the day of the show. (Beware using "selfie-style" pictures intended for social meals as a way to gauge progress.)

An advantage of posing throughout the year can also be having a feel for where/how your physique is improving and how best to display this. With a better back, your front lat spread may be more impressive, but only if you learn how to pose properly (over many months) to show this. With the trap size you gain this year, a "crab" style most muscular might be your most impressive pose, but **if you fail to experiment with and refine your posing during the Off-Season**, and simply stick with your usual hands-on-hips version of this pose, neither you, the audience, nor the judges will ever know how much better you've become!

Circumventing Brain Fog and Being Ready

The last month or two before your competition can present a temporal paradox. On the one hand, the toll of the diet can seem to make time stand still (and make even your typical list of daily tasks seem insurmountable, whereas the show day can creep up on you quite rapidly. As I mentioned in [Section 1.3 on Goal Setting](#), as an adjunct to the goals you set in filling out your [Personal Bodybuilding Inventory](#), you can plan ahead and be ready for your show, thus avoiding last-minute preparations while under the duress of Pre-Contest brain fog by **doing the following as early as possible in your Pre-Contest period**:

- Make hotel **reservations**, purchase plane tickets, set up tanning (and makeup) appointments, *etc.* Do all this

before Diet Fog hits. Pull all these details (flight info., confirmation #s, promoter contact info, etc.) in a **note file you can keep on your person (printed) and on your phone.**

- **Enter the show:** Fill out and send in the show entry form.
- **Make a Pre-Contest Packing List** to ensure you have everything ready when you leave to compete in your show. (You can Google many of these online, specific to women and men competitors in different divisions.) This would include things like (but not be limited to):
 - **Supplements** (specific to peak week).
 - **Suits** (backup, main suit).
 - **Tanner** (if you are doing it yourself – see below).
 - **Posing music** (and backup copy).
 - **Checkbook/cash/money order** to pay the entry fee if not paid already.
 - **Clothing** (Black/dark color, clothing to wear after the show).
 - Extra set of **bed sheets**.
 - **Toiletries** (including special skin prep).
 - **Food.** I have found I can typically fly with the day's meals as carry on (being sure not to bring any **liquid** condiments, nut butters, *etc.* that will almost certainly be confiscated at the airport **unless already applied** to food). Food for later in the day can be **frozen** (as a sort of ice pack) and several days of food can be pre-cooked, then frozen and packed in your suitcase with minimal risk of thawing. Some people also have **vacuum-sealed** food to help preserve it.
 - **Shopping list of things to buy upon arriving:** Water, the food you didn't pack including nut butters, jellies, other things you can't fly with.
 - **Entertainment:** A tablet with movies to watch, (e-)book to read, other things to pass the time backstage.
 - **Backstage Camping:** Folding Chair, pillow, sheets,

etc. for backstage.

- **Save room** in your suitcase for your trophies!!!
- Any other things you can think of.

- Keep notes of your **peak-week practice run with final adjustments that you plan to use** (See [Section 4.8 below](#)), both printed (in duplicate) and electronic versions, so you can use this as a guideline to keep you on track and grounded when traveling.

Tanning & Skin Preparation

If I were writing this book just a decade ago, I would be laying out the steps of exfoliating and moisturizing one's skin during the weeks before self-application of tanner, and how to it's best to start applying the product several days before stepping on stage to get the deep, even color that looks best under stage lights. (It was important back then to also have work-appropriate black clothing to hide the tanning dye that was sure to smudge through and ruin any of the clothes you might otherwise wear... But now I'm just being sentimental.)

Today, things are a bit easier and more convenient for competitors, as having an official company providing “tanning” services is as vital to promoting a bodybuilding show as having a venue and show date. Sometimes, at larger shows, there may be **multiple spray tanning companies** on site, which can work to your advantage, as you may find that one company's product(s) works best for your complexion/skin. If doing multiple shows (over two weekends, for instance) using the same product can help prevent interactions between two tanning products, as well as help you refine the process you use to prepare to be spray tanned, figure out how many coats you require, and find out what kind of posing oil looks best on you. (Sometimes, the tanner, but not the oil used by that company works well for creating your best show day look.)

This being said, here are some guidelines for tanning and skin preparation that you can apply to be sure your skin looks as good as possible when it's time to show off your hard work:

- Getting and having somewhat of a "

TANNING TIDBITS

- 1 CONSIDER GETTING A BASE TAN (IN LIGHT OF SKIN CANCER RISK).
- 2 FOLLOW SKIN PREP GUIDELINES TO A TEE!
- 3 BRING SHEETS & CLOTHES - TANNING DYE WILL BE EVERYWHERE!
- 4 PAY FOR EXTRA TANNING APPLICATIONS, JUST IN CASE!
- 5 USE THE SAME COLOR / PRODUCT CONSISTENTLY IF POSSIBLE.
- 6 GET 1-2 SHADES DARKER THAN WHAT YOU THINK YOU NEED.
- 7 POSING OIL / SHEEN IS AN ARTFORM!
- 8 DEMAND THAT YOUR COLOR IS PERFECT!
- 9 (FOLLOW ADVICE FOR COLOR REMOVAL BETWEEN SHOWS.)
- 10 ADVANCED: DIY COLOR AND BRONZERS CAN MAKE A DIFFERENCE!

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base tan" will typically help your look on stage (even for dark-skinned individuals) and make it easier to get good competition color. For this "base tan" to be worthwhile, however, it must be significant, such that many people might think you've already applied a coat of artificial tanner, or have been on an extended vacation on the beach. The base tan should be dark enough to even out your skin color, especially in places where you otherwise are not getting sun, so laying out as exposed as (legally) possible or simply using indoor tanning (tanning bed/booth) makes the most sense here to make your efforts worthwhile.

- Per the above, **if you have trepidations about skin cancer**, be it from sun exposure(2000) or indoor tanning(2001, 2002), these are valid concerns! Realize that a **good/right tanning product (for you), a skilled technician and careful attention to detail can give even the lightest of complexions a good, muscularity-enhancing look on contest day.** (For some, all the hard work of preparing for contest day does not warrant even the slightest increase in risk for skin cancer, and this is a very logical and reasonable concern to have, in my opinion.)

- Generally, I recommend that one read and adhere to the instructions for skin preparation provided by the tanning service you plan to use, including the products they provide. (However, if experimentation or other insider knowledge, such as that of a dermatologist or aesthetician suggests otherwise, **use your best judgment.**) These instructions will typically involve exfoliation (scrubbing your skin) and moisturizing, sometimes for weeks before the show. Most companies provide **explicit instructions** and if they don't or you can't find instructions, contact them (or find another company). The tanning company (and/or promoters) will also remind you to **BRING YOUR OWN SHEETS to the hotel** to sleep on after being spray tanned, and of course, **have dark/special clothing that you'll wear during the weekend while spray-tanned.** You won't typically have an opportunity to shower once the tanning process has begun, but the shower you have **after** the show may very well be one of the best of your life!
- (Know too, that you will be spray tanned wearing as little as possible, for practical reasons, of course. In the US, complete nudity is not uncommon, with women spraying men, but not the opposite situation (only women spray women, in my experience), so be prepared if you've never been spray tanned. Many men cover their genitals with a sock. It is not unreasonable to request you are tanned in private by a same-sex individual.)
- Buy **enough tanning applications** to ensure you're dark enough. Most companies will **refund you** if you don't need an application that you paid for up front.
- Use the **same color product/company** consistently if possible, year after year and for different shows. Check to see if the company you've used in the past that provided you good color at your shows, **even if not the official tanning company for your competition.** If you plan to do several competitions and have the option and no particular preference for a particular company/product/technician, pick the company that will be at the majority of your shows.
- **TAKE NOTE** of the **special instructions** for the last

steps before being spray tanned for the first time. Using different companies/products over the years, I have been given instructions to exfoliate or not exfoliate (no scrubbing), to moisturize one last time (using their product) or do the opposite. I was once given a tip to use dish soap (Dawn® brand) for the last shower before the first coat of Pro Tan®, which has worked well for me and my skin, but is something I would still double check with Pro Tan® to see if this is appropriate for you.

- **Posing oil can also require some trial and error/artistry**, including using gel-like products (Pro Tan® makes a Muscle Sheen product) and even Pam or another cooking spray. Generally, I've not found that topical vasodilating products designed to promote vascularity are effective in improving one's overall look. (Sometimes they can cause erythema – skin redness – and even a blotchy look in some individuals.)

- **Standards for what constitutes good stage color** seem to vary somewhat internationally, so its best to match the standards where you compete (unless you are certain your look is better otherwise). Generally, it's best to be sure you're a **shade or two darker** than what you seem to need under normal lighting. **The stage lights will make you look much lighter than you might expect.**

- It's possible that your **tan color can go bad** (e.g., your skin turns **from brown to green** overnight). If you run into this, check with your technician to see if this is a matter of bad product, or perhaps a chemical interaction with residue on your skin (deodorant, etc.) or your clothing or sheets (e.g., detergent).

- **Demand that your tan is right!** Unfortunately, the skill level and experience of spray tanners can vary tremendously. A good tanning technician is often a competitor her/himself, and can empathize with your desire to get your color as good as you can. Gather a second and third opinion if you're unsure and don't be afraid to ask for touch-ups to make sure your color is as good as it can be.

- Follow the company's advice for **color removal between shows**, especially if the color comes off

blotchy.

- **Advanced Technique:** Ask the tanning service you will be using about using a last-minute color product on top of your basic spray tan, such as a " **bronzer.**" (These can be used to transmogrify your look last minute if things go awry.)
- **Advanced Technique:** After years of frustration with the inconsistency of spray tanning, some bodybuilders revert to the **do-it-yourself method**, which is more time-consuming, but **much more under your control**. Some competitors have found they look best combining two different products (e.g., Pro Tan® and Liquid Sun Rayz). Also, some competitors (in the US) like adding a small amount of Dream Tan (red/bronze #2) on top of another product (often Pro Tan® competition color). Note that Dream Tan often not allowed by some promoters, as it stains fabric more easily than other products.

4.8 Peak Week – Carbing Up, Drying Out and Being Skinless

“Peeled, diced, ripped, shredded, grainy, separated, dry, crispy, full and round with roadmap vascularity.” These and many other bodybuilding slang terms (I know you know them...) are what you want to hear from comrades, friends, family members, competitors and especially judges when referring to you vis-à-vis the judging criterion of “muscularity(2003).” In anatomical terms, we’re talking about displaying as much detailed, visible, hypertrophied muscle as possible, thinly covered by a nearly fat-free layer of highly vascularized skin. The goal here (in bodybuilding) is to become a living, breathing, posing super-human anatomy chart.

So, why do so many bodybuilders seem to drop the ball during that last week of carbing up and dropping water, before the show, looking like a 2nd rate version of the “nasty” bodybuilder they were the week before? (Is “**peak week**” really the **Rubik’s Cube of Bodybuilding**?).

In this Section of the book, I’d like to cover the following:

- The big picture of making sure your stage physique represents what you earned during your contest preparation.
- Dig into the physiology and muscle biology of “skinning a bodybuilder” during the last week before a show.
- How peak week could actually look in terms of the particulars of training, diet and supplementation, based on my (physiologist’s) way to “solving the problem.” (Note here that this is just one way to go about this, as there are many ways to go about the last week before a show, including doing as little different from a regular week as possible.)

Peak Week: The Big Picture

In the throes of the last few days before competing, the mental haze that many competitors face can make it quite easy to get lost in a sea of details. This needn’t be if one can see the forest from the trees, in particular by:

- **Being In Shape** - First and foremost, being in shape is the name of the game, and ideally, you’re so lean (or

you conditioning matches the standard for your division if you're not competing in bodybuilding) that you know you'll look awesome without any manipulations during the week before the show. In other words, cutting water and carbing up can help, but it won't magically erase unwanted body fat. Being in shape means you'll not have to delude yourself or be tempted to take drastic measures to look better on stage.

- **Be a Freak, but Don't Freak Out** - Shoot for an "A" grade, but don't overdo it and try to get a perfect "A+."

Too often, less experienced competitors, under the looming pressure of show time, tend to over think manipulations, hoping for a magical transformation, and end up looking worse. A common mistake is to begin dropping sodium and water many days (or even weeks!) before the show. (I can only imagine this practice is to ease one's mind because we can't always look 100% peaked ("dry") all day long due to daily water fluctuations.) Conversely, last minute, unplanned (drastic) adjustments usually backfire as well. (This is why having a trained, objective eye of a fellow competitor who is not competing or yes, even a coach you've paid, can be useful: To **eliminate this "freak-out" factor**.)

- **When in shape, you may need to very little (or "nothing") at all...** If your conditioning matches the standard for your division (you're absolutely peeled as a bodybuilder), or your division does not call for extreme conditioning, it's possible that you the best course of action is to make no or only very slight changes in diet, training, water or electrolyte consumption. (The info. below should give you some ideas in this regard, such as reducing water and/or sodium intake slightly.)

NOTE: What Do the Judges Want?

As I touched on above, what you do during your peak week should be geared towards what your division calls for: Many women competitors in Figure or Physique (or even Bodybuilding) may need to be softer on stage than just a few days before (although these standards seem to change year by year here in the US). Some women, usually former bodybuilders who have transitioned into Physique, may even do better to sodium and water load to get a smoother, less muscular appearance. (The also may need to reduce muscular mass in

some cases.) Bikini competitors may benefit very little from dropping water (excepting menstrual water). I've seen men's Physique competitors with rock hard conditioning place very poorly at the national level (unfortunately). **This Section of the book is about obtaining the utmost extreme muscularity**, which falls in the realm of bodybuilding, and may be more than what is required for other divisions (in various organizations) in which some of you reading this may compete.

A Sure-Fire Way to Blow It

All too often I talk with competitors (backstage) on the day of a show and read threads on forum discussions where a competitor has done **little to no planning** of what to do during the last week before a contest. Again, this is not to say that anything must change as far as diet and fluid intake *per se* – that plan may be the best one if you're in tremendous condition, with muscularity and fullness already off the charts. If it ain't broke, don't fix it...

However, as Winston Churchill intimated, failing to plan may essentially be planning to fail. In that vein, an almost **sure-fire way to not hit your mark** on show day is not only to **not have a plan**, but also to **not have practiced that plan**. A **practice run** (or **mock show** day as I often call it) is imperative, in my opinion, for several reasons:

- You can find out **if your plan works**, generally speaking.
- You can **modify/hone the plan** in terms of training, diet, water, sodium and other factors.
- Even a previously successful plan (used in years/preps past) may not work as well because, as seasoned competitors know, **one's body may react a tad differently from show to show**, due to anything from **aging** over the years, **getting larger** year to year, the **training or supplement regimen** employed, or simply **getting better conditioning** from show to show within a contest season.
- Once a practice run has ironed out the kinks, this can greatly reduce Pre-Contest stress. It removes much of the guesswork and also gives you, the competitor/coach, a glimpse at how good you can be when you've peaked properly.

There are several **peak week practices** that I generally do

not agree with, that I'll list here. The explanation for why these methods don't make sense physiologically is implicit in the methods I present thereafter, but I'll touch on them here.

- **Gradually tapering water intake over the course of several days.** This slow reduction in water may just prolong the period during which one is dehydrated. Of course, if water balance is negative, body water will decrease, but the time scale of physiological processes to conserve water losses is on the order of minutes, rather than days. Thus, slowly cutting water over several days just ensures that the body will spend a prolonged period spent enduring unnecessary compensatory stress as dehydration is forced upon it. [For instance, antidiuretic hormone, aka vasopressin, which is released from the anterior pituitary and adjusts both blood pressure and kidney nephron permeability to water (85), is fast acting, with a plasma half-life on the order of a half-hour, not days(2004).]
- **Minimizing sodium from the diet for many days or weeks** before stepping on stage. Removing sodium from the diet may have a diuretic effect (see below), and thus increase confidence in one's conditioning during the weeks before a show, but doing so will also impair the plethora of physiological processes involving sodium (and chloride) such as glucose movement across cell membranes in the gut(2005) and skeletal muscle(561), thermoregulation(648), and it's many roles as the major extracellular (cation) electrolyte(85, 643). The last thing a bodybuilder needs during the final weeks of Pre-Contest prep is to be disadvantaged when it comes to utilizing carbohydrate fuel and properly thermoregulating.
- As mentioned **above in Section 4.2, re-vamping Pre-Contest training towards a lighter, higher voluminous approach** can be disastrous under some circumstances. However, during the last few weeks before training, one should **be very careful with loading and volume of training**. Timed right with appropriate intake of food to fill out, one can create a small rebound/tapering effect and have a physique that looks full, refreshed and well conditioned by adjusting training volume during the last few weeks Pre-Contest. The fear of muscle loss from a week or 10 days of

reduced training load is likely unfounded, as muscle mass can be maintained with much less training than was used to build it(35, 36, 42).

- Also, generally, as I've already mentioned, **drastic, last minute “Hail Mary” strategies** – the opposite of a planned approach – **often create problems**, particularly if they involve last-minute use of pharmaceutical diuretics to try to rid the body of subcutaneous water. [**NOTE:** I'll not be covering the use of pharmaceutical diuretics in this book, in part because they are controlled substances and are powerful drugs with potential adverse health effects(2006-2009). Anecdotally, I've found that pharmaceutical diuretics as typically used during peak week, disrupt water homeostasis substantially, often causing rebound water retention. Because of this, more than a week or two is sometimes needed before the same protocol could be employed with similar effects, thus precluding the development of a diuretic “protocol” that will yield consistent results if one is competing several times in a short time frame.]

Peak Week – Putting the Pieces Together Physiologically

Ridiculous muscularity means outrageously full muscles, loaded with glycogen (and even fat stores), covered only by a superthin layer of skin, devoid of fat and water. This means in the last week of the show, when subcutaneous fat should be dieted off, two primary goals present themselves:

- Filling the muscle with **carbohydrate (glycogen)** and **stored intracellular triglyceride** (“filling up”).
- Ridding the skin of **subcutaneous water**(“drying out”).

Next, I'll cover the underpinnings, from a physiological standpoint of how dietary carb, fat, water and sodium manipulation can get this job done (without using prescription pharmaceutical diuretics).

Filling Up: The 4 Basics

Here are the four basic principles we'll employ to “fill up.”

- **Water Follows Carbs!** Eating carbohydrate means storing glycogen and water. Muscle glycogen is stored

as a glycogen-glycogenin (carbohydrate-protein) complex ("granule") which has an osmotic effect, meaning that it pulls water into the cell with it (2010). Some research suggests(2011) that each stored gram of glycogen stored attracts about 3-4 grams of water to it [or 2.7g water/gram of glycogen in rat liver(2012)]. However, there seems to be a quite complex system of storing glycogen in muscle cells(2013), and research suggests the magnitude of glycogen storage-related hydration it **varies considerably**(90). I've found this in practice as well: Some guys can carb load, stay dry (meaning water is being sucked into the muscle cells and not elsewhere) and experience tremendous weight gain, whereas others will gain very little weight when feasting on carbs.

- **Fat Loading to Fill Out** Often you'll hear about fat loading as a "safe" or conservative way to fill out, and there certainly is truth to this notion. About 1/3 as much energy is stored as fat in muscle cells (intramuscular triglyceride; IMT) as is stored as glycogen-based energy for contraction(2014). This may amount to only around 1% of muscle weight(2015, 2016), but because fat is less dense than skeletal muscle(2017), the volume of fat, in a fully fat-loaded muscle cell, may easily exceed 2% of muscle volume(2018, 2019). In rats(2020), a single exercise bout can decrease muscle fat content by 30%, and only 3 days of a high fat diet can boost fat storage by ~70%.

The same effect on energy stores has also been demonstrated in humans(2016, 2020). The bottom line is that a modest but significant effect on muscle size can be had with fat loading. When you consider that a large (e.g., Heavy or Superheavyweight male) bodybuilder may carry over 140lb of muscle on stage (2021), doubling IMT (from a depleted to loaded state) could increase in muscle volume by more than 1%, equivalent 2+ lb of "stage muscle." I certainly would not be opposed to an extra couple pounds of muscle mass come show day! (To my knowledge, fat loading in terms of human muscle IMT content has been poorly investigated, but, in our rodent counterparts, there suggests tremendous variability across muscles in terms of IMT content(2022). Some competitors do really well with this strategy, so there might be an even greater

potential for “filling up with fats” than what I’ve estimated here.)

- Additionally, to our advantage in making use of fat-loading during the week before a show, only 3 days of a low carb, and thus high fat diet – just like what might be done to prime insulin sensitivity for a traditional carb-up – will also **effectively fat load skeletal muscle**(2020). Thus, as I’ll outline below, a fat-loading diet preceding a period of carb-loading does double duty by filling skeletal muscle with fat and carbohydrate.
- NOTE: It has been suggested that adapting a high fat diet, e.g., the bodybuilder who uses a ketogenic diet, might **impair glycogen** loading(2023), especially because attempts to restore glycogen/carbohydrate do not reliably improve exercise performance after adapting to a high fat diet(2024). However, direct glycogen measurements in humans(2025-2027) and rats(2020, 2028-2030) indicate you can glycogen load just fine, given enough carbohydrate and time(2026), even if you’re also fat adapted(e.g., after ketogenic dieting), or simply have been consuming a high fat diet for a few days. [Don’t forget that the type of fats in your diet, with monounsaturated fats(1437, 1481) and omega-3’s(2031, 2032) being preferable to saturated fats(1482), can affect(488) your insulin sensitivity and thus how well you carb-up.] From a practical standpoint, bodybuilders who regularly re-feed/carb-up Pre-Contest (with carb-cycled diets that involve regular “refeeds”) know full well that carb-ing up after eating a higher fat diet is possible. A huge advantage to such a cyclical diet (frequent refeeds) is that it entails **multiple “trial runs,”** where intimate knowledge can be gained as to the effect of varying carb amount, timing and source on filling out, spilling over and avoiding gastrointestinal “distress.”

■ **Carbs and Sodium Go Together** When you’re carb-ing up, sodium (Na^+) is also needed in the diet: The glucose transporters (GLUTs) required for glucose absorption in your gut and bringing that glucose into your muscle cells (for storage as glycogen) must “co-

transport” sodium along with that glucose. The two travel hand in hand(2033), so **carbing up at the time you might be limiting sodium (to help dry out) doesn’t make sense**. While this can be done (typically with the aid of pharmaceutical diuretics), it’s a juggling act and often not successful. For this reason, I like to separate the two processes to optimize each, and because glycogen levels stay elevated for quite some time (see below), sequentially carbing up and then drying out works quite well.

- **Once You’re Carbed Up, Stay That Way.** After a muscle is glycogen supercompensated, glycogen levels persist for up to 5 days if no exercise is performed(2034, 2035). Practically speaking, this means that cardio, at least high intensity cardio should be put on hold after (and while) you’re carb-loading. Also, excessive posing risks ruining the load. **The athlete who hasn’t polished his posing weeks, months and years before, or who nervously or excessively poses and checks condition** may run into trouble here. Of course, excessive pumping up backstage on show day can flatten you out, too. (Only as a last minute resort would I have a competitor try to drop water by doing a lot of posing – typically wearing clothes to encourage sweating - but these situations can occur.)

Hormones of H2O Homeostasis: How To Get Crispy Dry!

So, carbs and fats (fuel storage) will be tools for making the muscles full (per the above) but big and full muscles that are still obscured by water doesn’t maximize muscularity. My means of reducing body water content revolves mainly around manipulating the body’s own hormones of fluid homeostasis via careful consideration of the bodybuilder’s water and sodium (Na^+) intake, with some gentle encouragement from over the counter (OTC) supplements.

There are numerous hormones involved here (See the Table – Hormones of Fluid Homeostasis below) with a multitude of effects, but there’s no need to get lost in a sea of details. Most importantly, note that their actions are centered on controlling body water content by sensing **blood pressure** and, in particular, the **concentration of sodium in the blood**(85).

Table 20: Hormones of Fluid Homeostasis, Site of Release/

Metabolism & Actions

Hormone (System)	Organ(s)/Gland(s)	Actions
Renin-Angiotensin	Kidney, Liver, Lungs	(+) Blood Pressure, Conserve Sodium (Na ⁺) and thus H ₂ O, release potassium (K ⁺)
Aldosterone	Anterior Pituitary, Adrenal Cortex	Conserve Na ⁺ ; Conserve Water; <i>Release K⁺</i>
Antidiuretic Hormone (aka Vasopressin)	Posterior Pituitary	Conserve water; Conserve Na ⁺ ; () Blood pressure
Atrial Natriuretic Peptide	Heart	Counteract Above; Na ⁺ release (Diuresis!!!); Increase Glomerular Filtration

Drying Out: 3 Basics Plus The “Trick”

Physiologically, there are three things we’ll need to put to work to help dry out/drop body water (via diuresis). [I cover the use of sauna from a health perspective in Chapter 3 Special Section on Recovery, but won’t cover it in this context, due to the potential dangers in using specifically for the purposes of dehydration(1787, 2036), which I suspect could be amplified by the rigor of peak week.]

- The body is sensing sodium (Na⁺) and potassium (K⁺) levels, as well as blood pressure. Manipulating potassium is especially tricky because of potentially deleterious effects on heart rhythm(85, 2037). There is a reason (safety) that your typical potassium supplement only contains a small percentage of the RDI for potassium(2038). This leaves us with sodium and water intake as the tools of the trade.
- Water Follows Salt - Where sodium goes, water follows. Na⁺ is the principal extracellular electrolyte. (Extracellular means outside the cells, which is where the water lurks that we want to minimize when "drying out.") So, by causing natriuresis (sodium loss), diuresis (water loss) results, i.e., and water is lost from "outside" the cells, including from under the skin. [To a large extent, the kidneys control body water content by controlling sodium movement in and out of the blood and nephron (85).] As many of you have probably experienced, taking in large amounts of sodium will generally cause water retention, especially if you’re drinking lots of water. (Sodium intake by itself does

not magically pull water into the body, and can actually have positive effects on a physique as we'll see below. On the other hand, taking in more water can end up being a great way to dry out, if we're careful about sodium intake as well, which I'll cover in the next bullet.)

- **You can drink more water and/or consume less salt (Na^+) to dry out** (cause “diuresis”): Increased water intake will increase blood pressure and decrease (dilute) blood sodium levels to trigger the release of the hormones of water homeostasis (see Table above) to induce diuresis, until homeostasis (normalcy) is achieved. In particular, the diuresis is designed to return blood sodium concentrations to normal levels. **Similarly, if you consume less sodium (reducing blood sodium levels), these hormones will adjust to increase diuresis** to bring sodium levels back into balance. No mystery there, but we'll employ the information during the drying out process.

- I picked up a “**trick**” for **drying out** in perusing the literature on disuse atrophy and cardiovascular adaptations to weightlessness during space flight(2039). In particular, bed rest while lying with the entire body on a decline (a “head down tilt” typically of 6°) will mimic the increase in venous return to the heart that occurs without normal gravity (and loss of orthostatic pressure), and cause diuresis and similar cardiovascular adaptations(2040). This happens in part by increasing the release of atrial natriuretic peptide (ANP; see Table above) from the heart(2041, 2042). What this means is that when it's time to dry out (after carbing up) one can simply assume a **slightly inverted, supine position** (by elevating the foot of a bed, for instance, **not just elevating the legs**) to further facilitate diuresis (and natriuresis) during the day and overnight before competing, as well as any time drying out a bit more seems the right call (e.g., during an afternoon break between preliminary and final judging). [One **caveat** here is that sleeping or resting in this position can exacerbate **gastroesophageal reflux**, the symptoms of which can be reduced by sleeping with one's head elevated(2043).]

Homeostasis)

To make sure you're with me conceptually, I've included the figure below showing the redundant control of diuresis (urine formation; both inhibiting it) of **antidiuretic hormone** (ADH, released from the posterior pituitary) and aldosterone (from the adrenal gland). [For instance, high Na^+ concentrations trigger ADH release, which increases water reabsorption in the kidneys to restore (lower) Na^+ concentrations.]

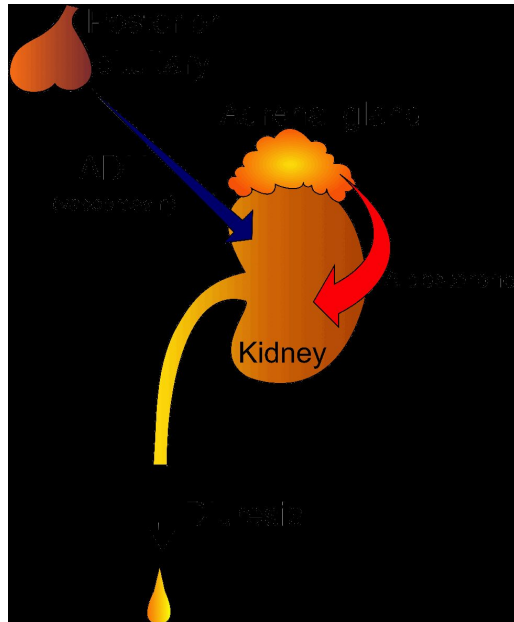


Figure 14: Effect of AntiDiuretic Hormone and Aldosterone on Diuresis (Open Source Image)

In the context of drying out, the opposite is true: If one were to consume more water than normal, relative to sodium, water is lost to restore blood sodium levels. So, if you **dilute sodium concentrations by drinking more water and/or consuming less salt (sodium), diuresis is the result**. The **bottom line** here is that blood sodium concentration ($[\text{Na}^+]$) creates a vital “setpoint” for regulating body water levels – one we can manipulate to dry out.

Homeostats, Like Thermostats, are Imperfect

What we have here in these mechanisms of controlling water metabolism and fluid balance is an example of a **homeostat**, a means of homeostatic control of body water content. Moreover, just like the **thermostat** in your house can't instantaneously change temperature, hormones work on a **relatively** “slow” time scale (minutes to hours) to shift and balance body hydration. Also, **some offset (or “error”**

away from a setpoint) must occur before your thermostat turns on or off: Set it to 70°F during the summer and the A/C may not turn on until it reaches 72°F and might not turn off until the house is cooled to 68°F. Homeostatic systems are imperfect – balancing in a kind of “dynamic equilibrium”(2044) – but function well to guard setpoints, be they room temperature or blood sodium/fluid levels.

Keeping this offset error concept in mind, imagine now if you held a hot flame (use your BBQ lighter of course) next to the thermometer (temperature sensor) in your thermostat: It would regulate around false setpoint and might even cool your house to what is actually 65°F or less, because the lighter is giving the thermostat false information about room temperature. Now imagine that it's a hot day, your thermostat is set to 70°F, the house warms to 72°F, the A/C kicks in and cools it to 68°F, after which it shuts off. If you then you hold a lighter up to the thermometer, the A/C system would recognize this as an extreme heat challenge and continue to blast out the cool air (despite an overly frigid room) until, long after you switched off the lighter, temperature rose back to up and the A/C turned back on. (In the meantime, the room would be cool for some time!) The **A/C system was simply tricked** into overcooling the room because you kept that lighter up to the thermometer, knowing that the system simplistically incorrectly operates under the **assumption that thermometer temperature represents temperature in the entire room**. One could even go so far as to cool the room further by adding fans or turning on a window A/C unit in addition to the system we're already “tricking.” We can make use of this same premise, by manipulating blood sodium concentrations (and venous return/blood pressure via the head down tilt “trick”), to “fool” the body into diuresis and hypohydration, effectively manipulating the hormones of water homeostasis to dry out before going on stage. [On top of this, as I'll cover below, one can use dietary means, caffeine and mild herbal and osmotic diuretics (vitamins) to further promote diuresis.]

“Hold a Flame to the Thermostat!”

To put the above analogy into action, one would do the following the day before the show (after carbing up):

- Consume large amounts of water relative to sodium for several hours, which will necessarily flush sodium from the system (remember that “water follows salt” – this is how our kidneys work) as well as dilute blood sodium levels, and then...
- This is best accomplished by first reducing extra sources

of sodium in the diet (such as via sea salt and most condiments) while consuming water at an above normal rate.

- And then, after “cutting off” sodium, abruptly halt water intake (“water cut off” or “dropping water”) about 3 hours later.
- Give the resulting diuresis plenty of time to take effect, typically by doing so late in the afternoon/the night before the show. (Timing will depend on the person, water and sodium intake, and how much water one typically “holds,” etc.)

The increased water (relative to sodium) will decrease sodium concentration ($[Na^+]$), causing relative hyponatremia. Like heating the room initiates cooling, the body will seek to correct blood sodium levels, i.e., to raise $[Na^+]$ via diuresis and establish its normal blood $[Na^+]$. (You’ll be urinating a good bit before and after the water cutoff if you’ve managed things right.) However, because body sodium content is intrinsically diminished due to diuresis(85), normal $[Na^+]$ is only established by reducing overall total body water. (In other words, you’ll be dry.) Timing is crucial here – and something you’d have to work out with a practice run should you decide to employ this methodology – because the multiple (redundant) hormonal and other mechanisms in place to preserve body water obviously are there to guard against dehydration. From a safety standpoint, this is beneficial because it’s difficult to go too far into dehydration using this natural approach, unlike using some pharmacologic means to dry out. (I will tell you, however, that once you’ve nailed down this process, it can be just as effective as any pharmacological approach I know of.)

Through trial and error (and hundreds of practice runs and shows over the years, both with myself and clients, including **IFBB Pro Dave Henry**), I’ve found it’s best to:

- Maintain **high sodium intake in the diet** (to establish baseline endocrine and water balance at a high level of sodium intake) for **a least a week or more before a mock show day** [and preferably at least a month before the show, **in lieu of blood pressure issues that high sodium intake can cause for some(2045, 2046)**].
- Increase water intake further for ~6-12hr the day before the show.

- Drop sodium intake (“cutting sodium”) to minimal amounts (**eating low sodium food only** thereafter, but **not entirely eliminating sodium**) about 3 (or more in some cases) hours before stopping water intake (“dropping water”). This creates a flushing effect before homeostatic adjustments would be made to prevent the desired diuretic effect and “drying out.”

"COOL THE ROOM WITH FANS & WINDOW A/C UNITS."

The above “trickery” will cause an “overshoot” as the body (endocrine and renal system) diureses to bring $[Na^+]$ back into line, but at a lower body water content than normal, sometimes by 3-5lb or more. Simultaneously, like adding fans and window A/C units to the already cool room in the thermostat analogy, one can utilize other dietary changes, **as well as caffeine and mild herbal diuretics and water-soluble vitamin**, to further promote diuresis. I'll cover the details in below, but the approach here generally entails dropping carb intake, increasing protein, and using herbs and vitamins that cause diuresis and osmotically pull water with them when the kidney eliminates them. The result, if all goes according to plan, is a **crispy-dry physique** on the morning of the show with muscles that pump up well and look and feel full.

One Way to Skin a Bodybuilder: Are Ya With Me?

The physiological concepts outlined above can be interwoven into at least one very effective way to pattern peak week, to maximizing show day, onstage muscularity. I'll condense the strategies at work here even more succinctly:

- **Fat Loading Comes as a Benefit of Preparing for the Carb Up.** Fat Loading can cause a persistent, significant increase in muscle size, so one can effectively fat load with the low carbohydrate (high fat), insulin-sensitizing diet that precedes a carb-up. This can be especially important for the competitor who has dieted on low fats and/or does a lot of cardio or high volume training leaving intramuscular fat stores relatively empty.
- **Carbing up Requires H₂O and Na⁺.** Sodium is needed for absorbing carbs and storing them as glycogen, so restricting it during the carb-up won't help with filling out. We also want water intake high during

the carb-up so it can be carried into and fill out muscle cells. After loading, glycogen supercompensation persists for several days as long as one doesn't use up that fuel.

■ To Drop Water, Manipulate H₂O & Na⁺ Intake.

After filling out with carbs and fat, one can then dry out by “tricking” the body with water and sodium manipulation.

Thus, one approach is to 1.) Fat load, 2.) Carb up and 3.) Drop water, a process that can proceed step by step in that order. By separating the carb up, which relies upon an abundance of sodium and water, from the drying out procedure, which entails minimizing the intake of both of these, we avoid a potential physiological conundrum. (Note that using pharmaceutical diuretics, i.e., drugs much stronger than caffeine in this regard, change the rules of this game considerably.) In the below sections, I'll **break down** the above theoretical concerns into the nitty-gritty **particulars** of how to plan your own “skinning” in terms of training, diet and supplementation during peak week. Also, I'll cover the **day-of-the-show decision making** in terms of “topping off the tank” (muscle fullness) and/or “draining off the excess” (drying out even more, if needed).

Developing Your Own Personal Peak Week Recipe

The approach I'm **describing will have to be tailored to each bodybuilder**: There are many ways to "skin a bodybuilder," but these principles work for almost everyone I've worked with. Some competitors will (intentionally) maintain a consistent diet and fluid intake during the last couple weeks before a show, changing as little as possible right through to the trophy presentation ceremonies. Other competitors have been known to "nail it" with a tightrope balancing act of pharmaceutical diuretics, dramatic last-minute dietary changes and other even more extreme tactics. The **predictable approach** I'm outlining here does require adjusting to the individual, but that's part of it's beauty: **Given a practice run** to set the basic framework, almost all competitors I've guided end up with a **stress-free plan to dial in conditioning with minor (if any) adjustments in the hours before prejudging**.

The Table below takes you through the “phases” of how a week might look, from 6 days out to a generic Saturday morning prejudging. Naturally, 2 day shows like some Pro Qualifiers or Pro shows like the Olympia require different timing. I'll break down each phase for you in terms of training, diet and supplements and how to adjust each for yourself.

Table 21: Generic Phases for the Week Before a Typical (NPC) Saturday Morning PreJudging. *GDA = Glucose Disposal Agent

"Phase"	Day	Training	Diet	Notes
Carb "Prime" & Fat Load	Sun	Legs (either day)	No/Low Carb	No Need to "deplete" with high volume weight training in most cases. Cardio would be tapered during this period as well.
	Mon			
	Tues	Push	No/Low Carb	
	Wed	Pull	No/Low Carb	
CARB-UP!!!	Wed	(Post-WO)	Start Carb-up	Add GDAs*, Same Carb Sources; Amt. ~Preceeding Diet, Training Vol., & Prac. Run Results. "Fill n' Spill"
	Thur	(none)	Continue Carb-up	
DRY OUT!!!	Thur (PM)	(none)	No/Low Carb &	Drop Na ⁺ 1 st then H ₂ O (us. betw. noon- 5PM)
	Fri	(none)	Water Load	
Touch Up	Sat(Show)Day	(none)	Depends!	Carbs, Fat, Na ⁺ Acc. To Mirror & Practice

Carb “Prime” (& Fat Load): Sunday - Wednesday

"Peak week" before marks the last Pre-Contest workouts (except for training between shows of course) and a low carbohydrate diet, to prime insulin sensitivity. One would generally set up this phase of "peak week" such that the entire body is trained using your regular training volume, spread over a 3-way split (typically over 3-4 days), with **legs first**. (For individuals doing **Fortitude Training®**, I typically have them do two FT-style Muscle Round workouts on Monday and Wednesday off this week, sometimes easing off leg training on the latter training day if holding water there has historically been an issue.)

- Empirically, sore and inflamed legs can more easily “hold water” than upper body muscles, so they are trained first, furthest from show day.
- Dropping down to a very low carbohydrate diet (less than 100g carbs for sure and usually minimal amounts) for just 4 days sets you up for carb loading (see below), but is still tolerable for most (even those not used to ketogenic dieting) and not too long to risk muscle loss.
- **Carbohydrate calories are replaced with fat calories.**
I generally increase protein slightly for insurance against muscle loss, especially if a person has not been dieting on no/low carb diet. There is not an intended calorie deficit during these low carb days, but the dietary switch can cause some folks to come up a bit short on total calories due to suppressed appetite, so don't be concerned with consuming extra fat calories

during this time. This dietary switch thus equates to a period of fat loading, and not a period of fat loss per se, but by the time the week is over (the following week), I almost always find that my clients and I end up sharper.

I have made use of this fact many times by employing more than one peak week practice run to help accelerate Pre-Contest fat loss.

- After years of doing otherwise, talking with others and reading a bit of research(2047), I finally convinced myself that **a high volume/depletion-style workout is really not needed in most cases during this period to get the desired glycogen supercompensatory effect.** Also, excessive (novel) exercise that causes damage (e.g., from going overboard with depletion-style volume workout to which the competitor is not accustomed) can actually impair glycogen storage(2048-2050), so I would avoid adding in any uniquely brutal, muscle soreness-causing training twists during peak week.

Carb Up (Wed – Thurs): "Fill n' Spill."

The term “**Fill n’ Spill**” is one I have borrowed from my friend Ken “Skip” Hill (<http://www.teamskip.net>): The idea here is to be sure that you take in enough carbs to fill the muscle cells as completely as possible and "spilling over" (getting watery) is one clue that has happened. After a few shows with a given protocol or repeated carb-ups in general (e.g., during the course of your diet), you'll know what and how much your body needs, but the "Fill n' Spill" idea is definitely a good visual guide, especially for carbophobes. If you are truly in shape, the benefits of being full will greatly outweigh any **minimal** potential gain in fat mass(89, 1810) from even the most aggressive carb-loading procedure (see below). By the way, my best guess is that “spilling” occurs because glucose to glycogen storage has slowed down relative to carbohydrate intake, and thus glucose (and sodium) is left to linger outside muscle cells. This creates an osmotic gradient in this “interstitial space,” i.e., outside the vasculature and “under the skin,” and creates a “thin film of water” covering the muscles.

Carb-Up Tidbits

Here are some important aspects to guide your midweek carb-up strategy:

- The carb-up should start just after the last workout before the show or even intra-workout, just as you're starting that last workout (on "Wednesday" - See Table above). This will help make use of the insulin-like effect of muscle contraction in loading glycogen(561).
- Especially for high volume trainees, **training one's weakest** (least developed) muscle groups **just before the carb-up** avoids a prolonged, low-carb (slightly glycogen-depleted) period and potential muscle loss. (E.g., if you have a "weak chest," train that last, just before carbing up, but be sure **not** to overdo it. A reduced volume workout/taper for the less developed muscle groups may work even better, because you'll likely be pumping up these muscles more in just a few days before stepping on stage.)
- As I noted above, if you don't train again (or pose excessively), the glycogen loading you get from your carb-up will persist for several days(2034, 2035), well into the weekend of the show. Thus, you won't **necessarily** need to carb-up during the day before or just before going on stage to ensure muscle fullness on show day. **However, this is a great option and works well – see below.**
- Also explained above, **sodium and water intake should be high** during the carb-up.
- **Carb load relative to your needs:** Larger individuals will need more carbs, and those who have been following lower carb diets and/or following higher volume training regimes will also need more carbs to load up. A 200lb bodybuilder might need to take in 1500g of carbs during a 36hr carb-up period using the strategy outlined here (see below).
- When guesstimating your carbohydrate intake during a carb-up, use the Fill n' Spill rule (see above), but consider that the low carb training and several days of ketogenic dieting(2051) early in the week reduce both hepatic and muscle glycogen. A large bodybuilder (NPC superheavy weighing over 230lb on stage) carries about 70kg of muscle mass(2021). In his case, this means that ~100g of carbs could be loaded into a "glycogen depleted" liver(2051-2054) (using conservative values from average sized men), and

another 1500g of carbohydrate(2027, 2047) would serve to supercompensate his muscle mass if starting at “depleted” levels approximately $\frac{1}{2}$ that of normal resting glycogen levels(2055). Additionally, dietary fuel is needed to cover basal metabolism and daily activity, which may add another 500g of carbs to the daily equation for a person this size (2056). Thus, **the most massive bodybuilders could conceivably need to consume well over 2000g of carbohydrate to ensure glycogen supercompensation over a 24-48 hour load.**

- **A common question** is whether one should adjust, in the upward direction, the glycemic index (GI), glycemic load (GL) or even the insulin index(2057) (or ability to stimulate insulin release) of the carbohydrates eaten as the load progresses and glycogen levels rise. This is a sensible question and reasonable approach, as raising blood insulin levels, which strongly determines the rate of glycogen synthesis (561, 562), would offset the slowing of glycogen synthesis as muscle cells fill with glycogen(572, 2055). From a practical standpoint, I've found that picking the right foods for the athlete makes a much greater difference than what GI, GL or insulin index tables might tell us. (This fits with the notion of biological interindividuality I cover in the [Special Section at the End of Chapter 2.](#)) This generally means choosing carb-rich foods that you have dieted on and are used to eating and/or any “special” food that experience tells you works well(182) for carb-ing up. Using Vitargo or other carb powders work well for some, whereas white rice or simply sweet potatoes sit best gastrically for others. I personally find that **sorbet** loads me up like crazy, despite the what might be high fructose content(2058). (Having sorbet with a few of my carb-up meals is something I definitely look forward to!!!) So, generally, one would go with carb sources that:

- Have been staples in your Pre-Contest diet.
- You know work well for you, based on previous loads and/or a practice run.
- Are not glutinous and dairy-based, unless you're absolutely sure they are not problematic for you.

- Are primarily glucose based [not composed mainly of sucrose or fructose (2058)]
- Also, you may find in a practice run that certain foods you recall eating to gluttonous glory in your previous Off-Season, do not seem to "sit as well" after several months of dieting without them. So, obviously avoid these.

I do find that intentionally keeping protein intake at your normal levels (~1g/lb/day or so) seems to help with carbing up, probably by amplifying insulin release(1605). Glucose disposal agents (GDAs) such as Mountain Dog's Ultimate Glucose Disposal Agent available at Truenutrition.com, and especially those containing alpha-lipoic acid (ALA)(339, 1134, 2059) with a preference towards the R stereoisomer(1139), seem to enhance the carb-up. (See [Section 3.7](#) for more on Glucose Disposal Agents and Insulin Sensitivity.) Also, creatine monohydrate loading (which is further enhanced by both ALA supplementation(339) and carbohydrate intake(1001)), exerts its own osmotic, hydrating effect on skeletal muscle(2060). Reciprocally, creatine improves glycogen storage, too(1000, 1001, 2061), so the combination of carbohydrate, small amounts of creatine and alpha lipoic acid has synergy that can be employed whenever loading muscle glycogen. [I suggest adding 1-2g of creatine with meals during the carb-up, especially for clients not already creatine-loaded(2062), but be wary of gastrointestinal distress.]

Other supplements that could be used preventatively or kept on hand as "insurance" to aid in digestion and prevent bloating when carbing up (or during the entire week) could include:

- Gas X (simethicone) for intestinal gas(2063)
- Digestive enzymes(857), such as those I've noted in the [Section 7.2 Resources](#).
- Antacids with pharmacological action (e.g., Prevacid) and/or simple buffering action (calcium carbonate)
- Perhaps even activated charcoal to reduce gas(2063).

"DRY OUT" PHASE (Friday) Basics

As discussed above *ad nauseam* , manipulating sodium and water intake can be used to create a hormonally driven flushing effect that results in a lower level of total body water. Here's how this can be done:

- **Weeks before the show**, one would have established

homeostasis at a “high” level of sodium and water intake. A relatively high [e.g., 5000mg/day(2038)] daily sodium intake and healthy, but not excessive water intake, e.g., about 1 gallon (approx. 4 liters)/day for at least a week before the practice run is initiated (about a month before the show). With this in place, when sodium and water intake is dramatically reduced (in succession), a significant physiological response can be expected. Some adjusting may be needed here, but usually, most folks I've worked with are happy to increase dietary sodium, as salt (e.g., via seasoning powders and, my favorite, sea salt) adds flavor to food. Drinking more water can also reduce hunger via gastric stretching as well (85, 860, 861, 2064), so this is a win-win during the last few weeks of dieting

■ <The priming workouts/diet, at the start of the weeks, and the midweek carb-up would precede the below.>

■ Starting about 24-30hr before the show: **Manipulate water and sodium.** This starts first by further increasing water intake (or rate of water intake) for about 6-12 hr (before eliminating water intake – “dropping water” – excepts the small amount from food). **One would “drop sodium” BEFORE “dropping water.”**

- The amount and timing of increasing water intake during this period is a bit of an art form here – this is why a practice run is imperative. Drinking a day's worth of one's habitual water intake (in recent weeks) in roughly half that time (doubling one's rate of water intake during the first part of the day before the show) will generally get the job done. However, this depends on the person, their tolerance for fluid intake and how much a typical day's water intake would be. Generally, though, this would fall well within what can be tolerated and handled by a healthy set of kidneys (658), although it's not always easy or terribly fun to do. The timing of this “water loading” must be initiated and sequenced (see below – “Time the Water Drop”) relative to stage time the next day. NOTE: I always urge clients to heed feelings of lightheadedness that indicate water intoxication and slow down their

water intake. Also, most find that being in close proximity to a bathroom is a “necessity” as well, as you would be urinating a good bit during this time.

- **Dropping Sodium:** Sodium intake during the start of the day before the show would be maintained at one's normal rate of intake (typically by salting food/consuming (sea) salt per the above). One would then minimize sodium intake (“dropping sodium”) starting just ~3hr before abruptly ending the water load (aka, the “water drop”). In other words, sodium intake would proceed normally, and then one would first “drop sodium” by switching to low sodium foods and eliminating any additional in the diet. About 3hr after “dropping sodium,” one would “drop water,” by drinking no fluids. Dropping sodium first while consuming large amounts of water creates the flushing effect discussed above.
- **Time the water drop relative to when you step on stage:** This can vary from ~12-15hr or longer (in rare cases) to give your body time to eliminate the water. How long this takes is a matter of the individual: How his/her body responds, how much water may need to be lost, and simply how well a person tolerates long periods without drinking water and being relatively dehydrated. Everyone is different in this regard, and this can vary prep by prep for the same individual, too. **The most IMPORTANT THING IS TO BE SAFE and when in doubt, consume fluids.**

As an example of the Dry Out Phase

- Male Bodybuilder, consuming 5000mg sodium/day, 1.5 gal water day for several weeks before his a show.
- Prejudging STAGE time is 11 AM Saturday.
- Friday: He wakes, and consumes 500mg sodium upon waking (8 AM) and again at noon ("sodium drop") and "water loads" by drinking 1.5 gal water spread out over the day, finishing by 3 PM ("water drop").

- He would then use the below strategies to further promote diuresis

Turn on Diuresis to Stay Dry

I generally employ several strategies to promote diuresis and stay “dry.” The dietary change would begin when water loading and thereafter (the entire day). The supplements (herbal diuretics, osmolytes, caffeine, etc.) would be introduced after dropping sodium but before dropping water (so they are in your system when water is dropped), and **continue throughout the drying out period before prejudging and over the course of the day or weekend of the competition:**

- **Dietary strategies (Low Carb, High Protein – See Table above).** Increasing protein intake the day before the show above normal levels will generate urea(643), that in turn generates an osmotic gradient during renal excretion and causes diuresis (85). Reverting back to a low carb/ketogenic diet (as used during the last few days of training) reduces body water content quickly(2065) (This also provides a **second opportunity**, during hours before the show, to further fat load.)
- **Herbal Diuretics:** An unfortunate limitation to incorporating herbal diuretics is that they need to be taken primarily in pill form using this plan, which can be tough to swallow when water is restricted. Also, there are not many clearly effective herbal diuretics (2066) that I've come across in pill form. Thus, I often take a cue from my clients and make use of any herbal products they may have found helpful. (There are many products out there.) I do favor herbal blends that include dandelion(2067) and add it if not part of whatever product a client might suggest we use. This is an area where I'm still learning and experimenting [and perhaps making use of a placebo/expectancy effect(2068, 2069)].
- **Osmolytes:** B-vitamins (or simply B-6) and Vitamin C, which are safe in high amounts(2038) but, as water-soluble vitamins, require renal filtration for excretion and thus bring about osmotic diuresis (2070). NOTE: Be wary of excessive Vitamin C, as this may cause diarrhea. One gram of Vitamin C (in capsule form –

tablets can be hard to swallow without water) and a B-6 or B-complex vitamin every 2-3 hours is a formula I've used with success.

- **Caffeine:** That's right! This is my secret hardcore diuretic! My general suggestion here is to increase habitual caffeine intake (via caffeine pills) by 50% to create a diuretic effect on the day before the show, focused in the early hours of the day if needed to avoid insomnia. **The morning of the show, one would also take a somewhat larger than normal dose of caffeine to propel diuresis.** I don't recommend a standard amount of caffeine, but rather an increase relative to the client's normal consumption. There is a limit to caffeine's usefulness. I have had clients come to me before a competition who are currently consuming upwards of 2000mg caffeine per day. In these cases, caffeine had lost its diuretic effects(2071) due to habituation(2072). I've found that one would need to dial back caffeine intake (to ~600mg or less) for at least several days (or longer) to restore a diuretic effect (2071) upon increasing the dose. (Overlapping the midweek carb-up with a period of reduced caffeine intake can cause sleepiness, but sometimes help with recovery during this week in those who don't sleep well during prep. (See also [Section 3.6 for Supplements to Aid in Sleep.](#)) **Clients who habitually consume an extremely high amount of caffeine** (e.g., 1000mg/day or more), and don't reduce this to restore its diuretic effects, **will often have a difficult time drying out.**
- **Other Supplements:** Many athletes are sometimes taking supplements or using medications that tend to cause diuresis, e.g., some asthma medications or perhaps other sympathomimetics. While adhering to your doctor's orders, knowing how these supplements and prescriptions affect hydration state (in either direction) should be taken into consideration. **As always, check with your physician to be sure that you avoid any contraindications or drug interactions.** As a rule of thumb, my vote is generally to change as little as possible, especially when uncertain what effect a supplement may on fluid homeostasis.
- If you tend to have slowing of gastric motility when drying out, consuming a bit of soluble fiber (such as

www.benefiber.com) can help with bowel movement during the dry out process (and thus help avoid gastric distention the day of the show). Also, many competitors find that a mild laxative such as a cup of "Super Dieter's Tea," which contains Senna (*Cassia angustifolia*), with the last amount of water consumed the day before the show will help with bowel movement(2073), which means a flat belly the morning of the show.

- **Also, of course, sleeping and resting with a Head Down Tilt as described above.** Mostly, you'll be staying in hotels if competing out of town, which means you would need to find something to elevate the foot the bed (without doing damage to the bed frame, etc.). Bedding stores sell footrests that can be taken with you, and it's often easy to find yellow pages or other sturdy materials to elevate one end of the bed. You may need to be creative, e.g., by using an ottoman or ironing board under the end of the box spring. (I've always managed a non-damaging solution to this conundrum. Please don't damage your hotel room's furniture.)



Remove Agents of Water Retention

The other side of the diuretic coin involves **minimizing stressors and supplements that might cause water retention** and thus slow the drying out process:

- **Eliminate Stress:** The biggest one here is stress during the day before the show. Watch a **movie, have fun**, enjoy the experience and minimize unneeded cortisol release, which can cause water retention(85). (**The hard part is over!**) Because this strategy relies on the

body's responses to create diuresis, psychosomatic effects have to be taken into account. I've had several clients essentially worry their way into a watery stage appearance, which is doubly frustrating after a successful practice run weeks beforehand. **Make the practice run as realistic as possible including whatever distraction** (movies, book reading, etc.) you would be using the day before and of the show. (This might even mean **hanging out with fellow competitors** who are chilled out and/or enjoying a **relaxing attraction** local to the area.) Sometimes, the practice run for a show is more about creating confidence and minimizing stress than about refining the mechanics of the process.

- **Remove Supplements** that cause water retention. This would include supplements like yohimbine HCl (at least 3-4 days before the show) and possibly (per your doctor's recommendations, of course) prescriptions like birth control or other hormonal preparations. For those competitors who use AAS, generally compounds that can have estrogenic effects (via aromatization) are worthy of concern.

SHOWTIME! (What's Next?... The Touch Up)

The day has arrived, you awaken, and it's time to "feed the machine" that you've coaxed into full, dry, stage-ready perfection. But wait... Are you really full?... How do you know if you're dry?... While some of these answers come more easily with experience and/or to the wise eye of fellow competitor/friend or even a coach you may have hired, **fullness** can be seen by the competitor looking in the **mirror**, sensed by using **proprioception** of the muscles (how well you pump up) and reasonably ensured if you **loaded heavily** earlier in the week (especially if you "spilled" when you "filled"). Luckily, **dryness** turns out to be a somewhat simpler matter as we have an "objective" tool at our disposal: **The scale!**

While the rules are not hard and fast here, **body weight** and water content during the week's plan I've described above **may vary by 10lb or more**. A competitor weighing **230lb** in the morning (after using the bathroom) a week before his show may drop to **225lb** (-5lb) before the midweek carb up, weigh **235-240lb** after "filling and spilling" (10+lb; Wed-Thurs), weigh even more after increasing water intake before cutting it off (15+lb; Friday), and then find himself weighing **220-225lb** (-5-10lb) the morning of a Saturday show, "dry

as a bone.” I suggest that all my clients **measure body weight repeatedly** (see below) during the practice run, as well as before the actual show, to get an idea of how his/her body is carbing up and handling water manipulations: This is vital for adjusting the timing of water loss. **Scale weight should be taken at these times (if not more often when first getting the hang of it) during the entire peak week:**

- Upon **waking** (after using the bathroom if you must) and **going to bed**.
- On a meal-by-meal basis.
- At **other critical times** during the week, including:
 - Pre-and post-carb load
 - At the time of the sodium drop and water drop (and the hours thereafter)
 - The morning of the (practice run) show upon waking and throughout the day
 - Especially just before and after prejudging
 - The hours leading up to the Finals.

On top of individual variations, the extent of the weight fluctuations will depend upon:

- **Previous carbohydrate content of the diet.** Dropping carbs altogether at the beginning of the week may mean a dramatic loss of water for someone on a higher carb diet, but little weight loss for a competitor already using a ketogenic approach. Also, how much peak post-carb-up bodyweight rises above bodyweight the weeks before will reflect the carbohydrate content of the diet leading up to the show.
- Generally speaking, **how aggressive the carb loading** is (total grams of carbs eaten) will determine how much glycogen and associated water is stored intracellularly, how much “spilling” occurs and how much weight is gained.
- **How well the dry out procedure worked** (of course).
- How well conditioned (lean) someone is: Leaner individuals will tend to lose subcutaneous water more readily. If you find that you drop water the night before your show more rapidly than during a practice run a

week or to earlier, this is generally a good thing and suggests you're in better shape.

Most importantly, the change (loss) of body weight (mainly indicating body water but also reflective of stored glycogen and intramuscular water), from the competitor's 1.) habitual morning weight (e.g., 7-10 days out when he/she should be in shape) and/or in 2.) the morning just before carbing up, compared to 3.) body weight the morning of the show tells us how well the drying out procedure works. You should expect to be lighter the morning of the show if the dry out worked well – see below. The point of the peak week is to **look better than the week before**, so if **your body weight is not the lightest of the entire week on the morning of the show**, this is likely due to one of these reasons:

- You may not need to dry out/do a peak wee: **You were already dry and in great shape before the peak week.** (In this case, your weight would probably be roughly the same on the morning of the show compared to before starting peak week.)
- **You were incredibly carb depleted when you started the procedure** (this would be rare) OR
- **The peak week strategy did not work** (you didn't dry out) and adjustments are necessary.
- **You employed the Advanced Loading Technique I** cover below.

NOTE: The (typically maximum) body weight at the time of dropping water (the day before the show, after “water loading”) compared prejudging weight is also a useful indicator of the rate of diuresis. From this, a “**temporal trajectory**” can be plotted to adjust the timing of the water cut off to ensure you're dry on time for the show, but not unnecessarily early.

How To Tell if You're Dry?

Generally speaking, someone is “dry” who demonstrates a conglomeration of the following:

- **Looks dry!** There is a grainy dry appearance to the physique.
- Finds that **scale weight is not budging** (diuresis has come to a standstill) for several hours in the wee hours of the morning (e.g., between 5 AM and 8 AM – several

hours before stepping on stage) of the show and urine is scanty and dark.

- Sometimes, competitors will notice that their **skin seems extra dry** and is capable of **soaking up posing oil** easily.
- As noted above, finds that **scale weight is less on the morning of the show** (*using the above protocol*) than the week previous or on the morning before carbing up. **It is possible** to be dry but find that scale weight is not at its lowest if the carb up was especially effective in loading the muscles with water and glycogen. Everyone is different in this regard, so this is yet another reason to do a practice run!

So, What do I Eat and Drink (Breakfast before Morning Prejudging)?...

I'll keep this simple, as this is the point when many competitors will tend to over-think the process.

If you are truly "dry" the morning of your competition, as long as you don't drink water, you can eat almost anything (even salty foods) and not "spill" over for many hours and even up to a day (if not longer): There simply is not enough extracellular water to shift and create the "spilling" effect, in my experience. Given this, almost any (carbohydrate containing) food that you know **fills you out well** (and is easily digested and absorbed, i.e., tolerable to your gastrointestinal system) is a viable option for the **"pre-prejudging" meals**. Thus, these pre-prejudging meals should ideally be composed of **foods you've eaten during the weeks previously** (or during a practice run) and won't shock your system.

The day of the show breakfast could also very well be a **"shitload" meal**, meaning a meal chock full of fat, carbs and sodium (bacon, eggs and pancakes, for instance), or, for others, simply a more conservative meal of Ezekiel toast, jelly and egg whites. Further loading of carbs (and fat) in these meals top off muscle cell storage (and move water in the desired direction). If you are tempted to eat nothing, note that your liver will likely be low in glycogen from the previous day's low carb diet and you do need fuel to support activity and basal metabolic rate during the day. Sodium in a shitload helps with vascularity, which is not terribly important in judges' eyes, and in doing so draws water into the vascular system, meaning less fluid is available to slip "under the skin" and obscure muscle hardness, separation and definition. A well-timed and appropriate shitload meal, be it with "shitty" foods (burger and fries) or more healthy

sources of fat, carbs and sodium (full sodium peanut butter, gluten-free breakfast bars, and farm-fresh eggs cooked in extra virgin coconut oil) can have rapid visual effects on a physique that's receptive to these nutrients. **This meal(s) can be a somewhat critical one, so (yes, I'm reminding you), a practice run is advised.**

You can take your time with the morning food intake: One could just as well eat several small meals and/or slowly snack on food over the course of the morning/part of the day before prejudging. Gastric distension can ruin a look on stage. The process of drying out can slow digestion for some, which is why a small amount of a soluble fiber source like Benefiber® and a cup of senna tea the day before the show (see above info. on [Breakfast on Show Day](#)) can help ensure a tight midsection the morning of the show. (Another cup of senna tea might be used the morning of the show, but **one runs the risk of having GI issues** backstage that could be quite inconvenient.) Note here that gastric remedies such as digestive enzymes, GDA's (but not creatine, which tends to cause subcutaneous water retention in some) would still be used during the pre-prejudging meals. **Also, note that the supplemental "agents of diuresis" (herbs, vitamins, etc.) noted above would continue to be used on show day as well.**

Breakfast Before Prejudging: Other options

If you're not sure what to eat (because of uncertainty with being dry and/or full), then there are other options. My personal proclivity is, **when in doubt, at least stay dry:** A dry, conditioned competitor will usually fair better than a full, watery one.

- **To continue drying out**, you can simply maintain the previous days low sodium, ketogenic, "water-free" diet, up to and through the prejudging.
- If you feel a bit flat but suspect you are dry, you can load "**conservatively**" by nibbling slowly with **low sodium, high carbohydrate foods** like no-sodium rice cakes, honey, *etc.* This will allow for a controlled influx of carbohydrate without the risk of spilling that large insulin spikes or excessive sodium intake could cause. Ideally, these carbs will be taken up and stored as glycogen, pulling water with them and drying the competitor out.

Remedies for Being Flat Just Before Going on Stage

Generally speaking, if your muscles simply seem flat and unresponsive and you're within an hour or so of taking the stage, you

can try the below, in order (if you haven't already). **Just remember:** It's much **more difficult to remove water** (dry out) than it is to add it back, which simply requires drinking it...

- **1st Remedy:** Add a low sodium fat source, like **unsalted (sodium-free) nut butter** or even a tablespoon of **coconut oil**.
- **2nd Remedy:** Slowly consume a "dry" (low water content), low sodium source of carbs (e.g., rice cakes, jam, etc.).
- **3rd Remedy:** You may be electrolyte "depleted," or unbalanced in some way, so adding a **tad bit of salt** (e.g., 250-500mg of sodium) from sea salt, which contains minerals other than sodium and chlorine, may help. **A multi-mineral may be helpful here**, too, simply by giving the body several minerals so it can make re-establish electrolyte balance.
- **4th Remedy:** Add water in 4-8oz doses every 15 minutes or so and check the effects with a bit of posing. A little can go a long way in these circumstances.
- **5th remedy:** Personal tricks like a nibble of a bar of chocolate can have a positive vasodilatory effect. I've not personally seen that niacin, topical vasodilatory products (you've smelled them if you've ever been backstage) are helpful under these circumstances, but these and other tactics [such as nitric oxide/"pump" supplements such as beetroot juice extract([1333](#), [1334](#))] can be tested during a practice run. However, in my opinion, if the pieces have not fit together with the above general approaches, **no last-minute bells and whistles will make or break stage appearance**.

Troubleshooting: Cramps

FIRST AND FOREMOST: If you're having a **medical emergency**, cramping or otherwise, make that known to those around you so you can get appropriate help. In my experience, cramps can often be remedied using **taurine** (at least a gram and up to 5 grams might be needed for some folks), a **multi-mineral** and/or simply adding back a small amount of **sodium** (again, I prefer sea salt). Sometimes small sips of water, especially if contains **quinine**([2074](#)) as found in tonic water, will do the trick here as well. The pediatric electrolyte formula **Pedialyte** has been known to rescue more than a

few competitors from disabling cramps and, **pickle juice** (or simply acetic acid or vinegar) is a less tasty, though potentially effective fix for cramps as well(2075).

What About After PreJudging and Before the Night Show?

After prejudging, if you're in the running to be judged again at the Finals, or if you just want to look your best for friends, family and the audience, the **same decision-making process** described above (Are you flat?... Are you full?...), can be made regarding **meal choices**. Using scale **weight and appearance** at the prejudging as a guide, you'll **generally need to add some water and carbs** even if you looked great (dry and full) on stage during prejudging, simply due to the rigors (posing) of the show. **As a rule of thumb**, adding back (drinking) water in an **amount equivalent to the body weight lost over the course of prejudging** (pre-stage weight minus body weight after prejudging), and possibly more if you were overly flat, is a safe bet for the meal after prejudging, assuming of course that you looked as desired at the prejudging. For example, if your weight was 190lb, absolutely dry and full before stepping on stage and you weigh 187lb after pumping up and the comparison rounds of prejudging, this would mean a liter of water (about 2.2lb) would be in order, along with a high carb, low sodium normal-sized meal (generally avoiding salty foods/condiments). This approach almost always leaves competitors **drier at the night show**, but not flat, from what I've seen. Note of course that **if you missed your mark at prejudging** and were still "holding water," this is the time to remedy that, e.g., by switching to drying out "mode" in terms of diet (low carb), sodium (minimize) and water (minimize).

In the hours before the Finals, on the same day or even the next day, the same approach to water and food you use the morning before prejudging can once again be applied. The **most straightforward example** of this is a finals/night show on the same day, in which case, **a repeat of the morning's breakfast meals** (if they worked well that morning, of course) would be a good general strategy while watching one's appearance of course. **Two day shows become a bit more complicated**, but essentially entail recreating the same state of hydration by using roughly "the same" protocol and timing of sodium and water as employed the day before (with modifications as needed): In other words, you would recreate the water and sodium manipulation process of the previous day as well as possible (loading water and cutting it off, etc.) to set up a "**temporal trajectory**" for being dry for Finals.

Advanced Loading Strategy: Day Before Loading (Loading After WeighIn/Making Weight) with a “Loading Workout”

The birth of the “shitload” technique seems to lie with the observation that **many competitors would look better the day after a show** compared to the day there were on stage, after having a supersized, delicious post-show feast. This, of course, suggests they were not fully carbed up and/or hadn't taken in enough fluid. (Some of these competitors may have also stayed dry due to the use of pharmaceutical diuretics.) Thus, it makes sense to take in these normally post-contest celebration foods (pizza, burgers, pancakes and bacon, etc.) or whatever foods help one load the best, **before stepping on stage** if you want to truly peak the morning of the show. With an otherwise metered, controlled strategy that has been practiced, and if the physique is “dry,” **loading the night before prejudging** can work quite well.

This strategy is also one that can be useful for competitors who forgone a carb-up earlier in the week and/or dried out earlier on the day before prejudging to make weight (fit under a weight class limit). Based on dual experiments John Meadows and I initiated during our 2016 contest season shows, I've formulated this "Advanced Loading Strategy" thus that involved a full body "loading" workout in the latter half of the day before a show. In this scenario, the "loading workout" is a bit like the pumping up and posing of a show, and the carb-up meals take the place of the post-contest food and water, with the purpose of making you look phenomenal the day of the show, rather than just the day afterward:

- Shift the morning-of-show carb-up meals to the night before a morning prejudging. This requires that one **be dry the by the latter half of the day before the show** and before starting the workout.
- **Starting the carb-up process during the loading workout** and continuing until the next day before prejudging.
- Include water during this carb-up to help with the filling out process. The amount of water would be based upon how dry one is, how well one's physique is filling up without watering over, and also how much weight is climbing (as an objective check). One might expect to **gain anywhere from ~2-10lb**, with greater weight gain in those competitors who are **larger, leaner and drier** at the start of the carb-up.

- **As noted above**, one should have gone through a drying-out procedure (dropping carbohydrate, etc., as detailed in this Section) before starting the carb-up, to create a safe starting point for introducing water and gradually filling up. (This might entail cutting water two days before the show, e.g., on a Thursday, before a Friday loading workout that precedes a Saturday show.) For the sake of safety still employ the same techniques to promote diuresis (osmolytes, herbal remedies, caffeine and the head down tilt "trick" when sleeping/resting) after starting this process that you employed in getting dry before the loading workout.

The amount of carbs consumed during this **Advanced Loading Strategy** would depend upon the size of the individual and the extent of depletion due to the previous week's workouts and carb-up (if any).

Carb intake during this 12-18hr period range from simply 200 to 1000+ grams of carbs (assuming one starts with low body water). One **advantage** of this approach is to ensure glycogen loading via the workout (see below), i.e., harness the insulin-like effect of contraction (73) while providing carbohydrate. Starting the carb-up the night before also lengthens the period of filling up/topping off glycogen during the hours before stepping on stage, valuable time if a competitor has restricted carbs the previous week in order to make weight. The **disadvantage** for some may be that one must monitor condition continuously during the course of the prolonged pre-stage carb-up, adjusting carbohydrate and fluid intake as one would during the morning of a show upon waking (see above). For those who are adept at monitoring their physiques (or have a good set of eyes to rely upon), this extra period of tinkering is a good thing. For others, the guesswork could be more stressful than fun and thus backfire.

The steps of this **Advanced Loading Strategy** would be:

- Be sure that you're dry on the day (afternoon, early evening) before the show.
- Do a **Full Body Pump Style Workout** while consuming a **high carb** (50-150 +g) intra-workout drink with a small amount of protein (15-35 +g; see below). Water consumed during this workout might range from 1-4 liters. [Remember, you'll have the night to drop water before a morning prejudging if needed and glycogen is stored with water(90).] Perform a variety of exercises for each muscle group, using light loads one could possibly perform 20 reps with, but stopping each set 2-4 reps short of failure. Using short rest intervals, one

performs as many sets as a needed to get a very nice and full pump in the muscle (see below), adding water as needed during the workout. Sodium would typically not be added, other than what is in your carb and protein sources. Note here that the point is not to further deplete glycogen, but rather further its formation by combining ample carbohydrate during the exercise bout(73, 554, 582, 680, 2076), so the workout should not be brutally taxing but more like what you might do if you were wanting to get as pumped up as possible before going on stage and had an entire gym at your disposal.

- **Large muscle groups** (Back, and Legs) on average with ~3-6 high rep sets.
 - **Medium Sized Muscle Groups** (Chest, Delts and Calves) would require ~2-4 high rep sets.
 - **Smaller Muscle groups** (biceps and triceps, abs) and **touch up areas** (glutes, posterior delts, adductors, etc.) would require 1-2 sets
- **During the workout**, one would consume an easily absorbed liquid carbohydrate such as a **high molecular weight carbohydrate source** [highly branched cyclic dextrin(588, 589, 1614) or Vitargo(2077-2079)], combined with a **pre-digested protein source** such as hydrolyzed whey or casein. Protein combined with carbohydrate may speed glycogen replenishment(441, 583, 584), perhaps by increasing insulin over carbohydrate alone(441, 583), and hydrolyzed protein sources increase insulin more so than intact protein powders(817, 818, 2080) and may even offer the advantage of greater glucose transporter recruitment(824) and glycogen synthase activity(825)for glucose disposal into glycogen.
- **During the Advanced Loading Strategy**, use a **glucose disposal agent** including alpha-lipoic acid (as discussed above), but not creatine, if you find these help you to carb-up.)
- **After the workout**, low-fat, high carb, high glycemic index, low sodium (but not sodium devoid) foods would be consumed along with water in about a 3 - 5:1 ratio [**water(ml):carbohydrate (g)**] during the first portion

/meal of the carb-up. E.g., someone who takes in 100g of carbs in this first meal might consume 300-500 ml (10-17oz) of water.

- With the post-workout meal and thereafter begins the **juggling act of consuming carbohydrate and water to optimize the physique**, pulling back on the carb-up as need (reducing carbs, consuming high protein/protein only foods, etc.). This aspect of this Advanced Loading Strategy is decidedly as much intuition and experience as anything, perhaps even more so than meal selection on the morning of a show when starting in a very dry condition, because both food choices and water intake are juggled. In your favor, body water usually declines overnight (and you would also be **employing agents of diuresis** as noted above), so errors in excess carbohydrate, water (and possibly sodium) intake by the end of the day can often be remedied by a night's sleep and additional measures can be taken the next morning. Again, for the sake of simplifying the equation, one would likely continue to employ the measures to turn on diuresis and stay away from things that cause water retention (especially excess sodium and stress), as I've covered above.

How About After the Show – Will I Bloat up like a Pufferfish?...

The simple answer is, “No, shouldn’t bloat up like a pufferfish....” Because the perturbations created by the methods I’ve described here are essentially non-pharmacological (with the major exception being caffeine), homeostasis re-establishes itself without a hitch, in most cases. I’ve had several clients use the above procedure (tailored to their needs) to stay “dry” for 3-4 days in a row for photoshoots: They simply repeat the same daily pattern (roughly) used during the 24 hours before prejudging, drying out and staying carb-up up day after day. (Once you’re in shape, barring a binge, this is relatively easy to do.) I suspect that the high water and sodium intake during the preceding week(s) sets the body up to more readily return to high(er) water and sodium intake with less water retention than a more restrictive dietary approach would (e.g., if one had reduced sodium for weeks before a show, as some competitors do). The **rebound bloat** that most of you have at least heard of following pharmaceutical diuretic use **has not been a problem** for myself or clients who gradually taper their caffeine intake and slowly return to

re-introduce “Off-Season” foods to their diet.

Lastly, it’s an **almost universal benefit** that doing a peak week as I’ve described above (if carried out in full) results in a **quantum leap forward in conditioning**. In fact, with clients I’ve worked with for several shows, this is such a predictable fact that I count on it when considering how “hard” the diet needs to be to get in shape by show day and even have used an extra practice run (or two!) to help propel fat loss.

How to Nail Your OnStage Debut as a Living Human Anatomy Chart – A Big Picture Checklist

I’ve outlined one method of optimizing muscle fullness and dryness in this section, with the flexibility of using the Advanced Loading Strategy in cases where one must make weight or feels that the strategy is warranted (i.e., has a tendency to come in flat the day of the show). This is only one methodology – that must be tailored just a bit to suit each person – but it routinely gets the job done for my clients and myself. Here are some of the important **Big Picture** items I like to keep in mind:

THE PEAK WEEK



B I G



PICTURE

**Be in Shape 2+ Weeks
Out**

**Do a Practice Run 3-4
Weeks Out**

**Make the Practice Run
COUNT!**

**Shoot for an "A" - Don't
overreach for an "A+"**

**Use the Scale, Mirror &
An Objective Set of Eyes!**

**If it Ain't Broke...
Peak Week may be a Regular
Week with Minimal Changes!!!**

Have Fun!

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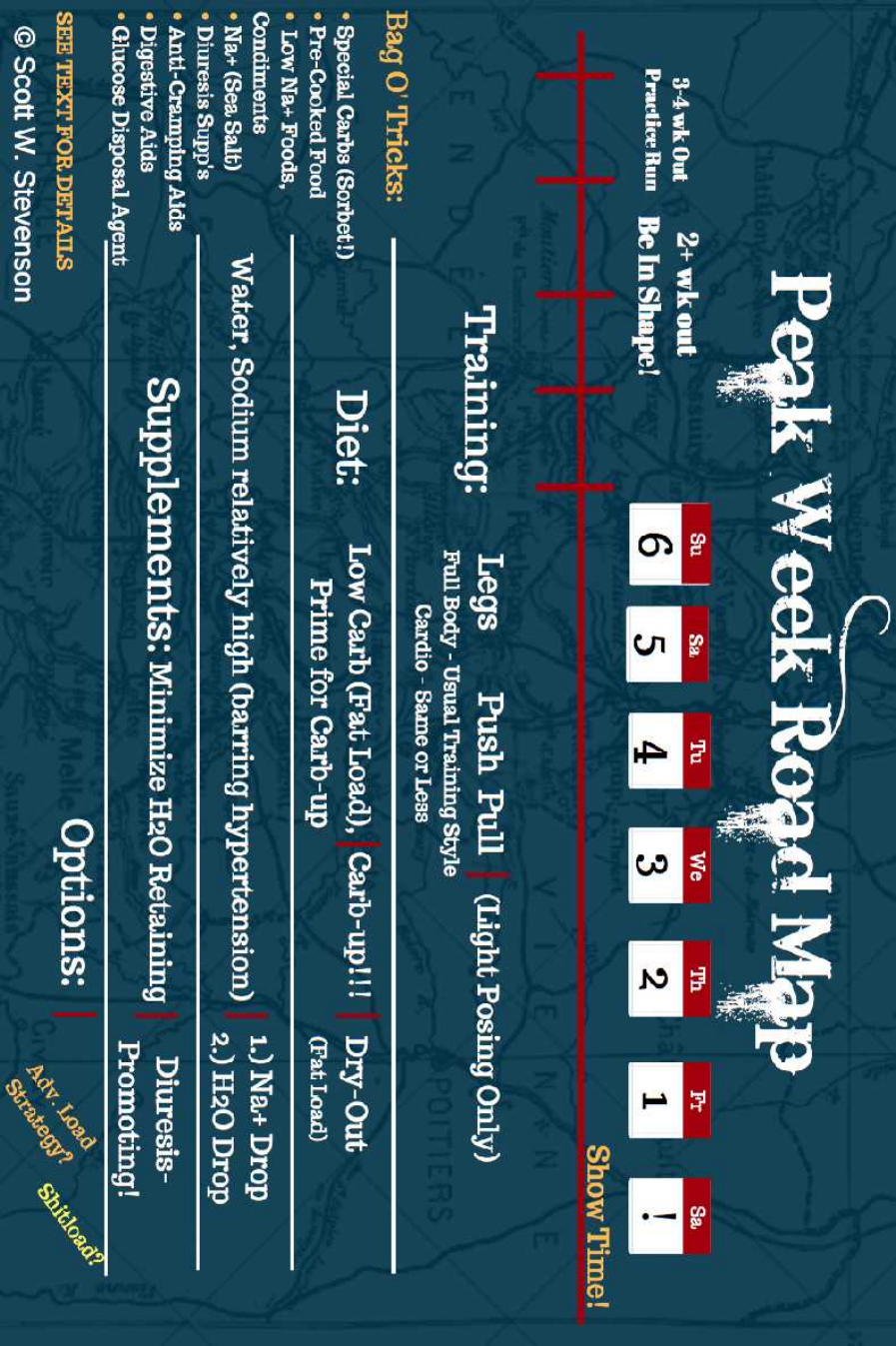
- **Be ready 2 weeks out.** The fanciest peak week carb/dry procedure won't matter if you're still "holding fat." You may load like a semi and dry out like a tumbleweed, but if you're not lean enough, the fullness and reduction in body water will not be visible.
- **Do a Practice Run 3-4 weeks out,** and even another if needed before the show. As I've noted, most of my

clients lose body fat quite well doing practice runs, even with very aggressive carb-ups, so don't fear that a practice run will set you back as far as conditioning, at least if done in the manner I've set forth here.

- **Make the Practice Run REAL:** Don't half-ass this. If you nail it during practice, the show week will be a breeze: You'll have already "been there, and done that." Only a solid practice run can be modified to generate a strategy that you can rely on for the week before your actual competition.
- **Shoot for an "A" and don't over-engineer in hopes of an "A+."** Stressing out and trying to push some aspect of the carb-up or dry out for the "perfect" peak week usually backfires. The same goes for most last minute changes. The real work is during the diet and preceding Off-Season. Even the most delicious tasting "icing" won't cover up the flavor of a nasty tasting "cake," so focus on getting the basics in place and avoid last minute shenanigans.
- **Use the Scale and the Mirror.** As I noted above, monitoring your body weight tells you about glycogen loading and water loss and can be one of few "sane," unbiased, "objective" opinions you can count on during the course of a competitive weekend of mind games. Just like the iron, the scale doesn't lie.
- **Keep a friend, coach or even a judges' eye (without conflict of interest) close by** to help you if you do feel like a last-minute "change of plans" is warranted (but mostly so that person can tell you not to change anything).
- **If it ain't broke... Don't Fix It!** If your current peak week method works, then stick with it, even if your peak week simply means changing nothing. If you find that there are advantages to my techniques (e.g., not using pharmaceutical diuretics as some do) then, but all means, consider making use of what you've learned here. However, when in doubt, keep it simple and if it ain't broke, don't fix it.
- **Have Fun!** The hard work is hopefully done by the time peak week has arrived, and stressing out certainly can't help, so this is the time to enjoy the fruits of your

labor!

Figure 15: Peak Week Road Map.



Chapter 5 – The Critical Thinking Bodybuilder

“No way of thinking or doing, however ancient, can be trusted without proof. What everybody echoes or in silence or passes by as true to-day may turn out to be falsehood tomorrow, mere smoke of opinion, which some had trusted for a cloud that would sprinkle fertilizing rain on their fields. What old people say you cannot do, you try and find that you can. Old deeds for old people, and new deeds for new.” –Henry David Thoreau(2081)

5.1 Critical Thinking & Ways of Knowing

One of the most important factors for coaching your way to bodybuilding success is attentiveness to detail and **critical thinking**, about your own actions and what you've been told (including what you've read here in this book). This means fact-checking and knowing whom to trust, because, at some point, we all have limitations in time and knowledge and must rely upon others. I believe that one can better contextualize and thus utilize knowledge by recognizing the different "ways of knowing (2082):"

- Tenacity
- Intuition
- Logic
- Empirical Evidence
- Authority
- Scientific Method

I'll cover the first four of the above in this subsection and the last two in separate subsections below, given how important I consider them in the context of this book.

Tenacity: This is How Everyone Does It

We sometimes simply believe in things "tenaciously" because they are accepted, traditional beliefs such as the need for Pre-Contest cardio or certain foods that everyone must eat to get lean. As you've perhaps seen in this book, these firmly held beliefs may need questioning, so don't be afraid to think **outside the box**.

Intuition: I feel it in my Bones

On the other hand, "**outside the box**" thinking based on intuition is often rejected by the "Old Boys" network. Intuitively driven actions may have little to no objective evidence to back them up. A good example of what might have seemed ridiculous initially to some, but is quite effective for producing muscle growth(2083-2086), is training with **blood flow restriction** ("Kaatsu" in Japanese), which was **actually intuited** by the inventor of this technique(2087). Again, **outside the box** thinking can be fruitful.

Logic or Rational Thought: I Lift, Therefore I Grow

Logic can be our best friend but is still limited by that which is unknown to us. Bodybuilding social media and discussion boards, however, are fraught with informal logical fallacies and logic that is sensible, but that may run contrary to what science has ascertained. [An example would be the contention that cardio is the most expedient means to rapidly expend calories and therefore must be the “best” way create a Pre-Contest caloric deficit, which ignores the possibility that cardio risks muscle loss(1662).]

As far as **logical fallacies**(2088), be wary of **strawman** arguments (one's statements are twisted into false "strawmen" statements with different meaning that what you said or intended to implied), **ad hominem** attacks (suggesting someone's argument is invalid because of past actions or reputation), and the **red herring argument** (e.g., "if the great bodybuilders of the past didn't need it, it's worthless"). In essence, if you sense an evasive, confusing, defensive or odd conversational style that fails to stay on topic, there is a good chance that person is using logical fallacies to counter your argument.

Empirical (Sensory) Experience: Been there, Done That

Doe experience trump everything?... Experience is **incredibly** valuable, of course, but one should first and foremost realize that one's own experience may differ greatly from that of others, which is a function of biological interindividuality (see [Chapter 2 Special Section on Hormonal Manipulation](#) for more on this topic).

Experience can also be created by "expectancies" that manifest as self-fulfilling prophecies. For example, an athlete's (or his/her coach's) expectations can dramatically influence performance (2089, 2090). Positive affirmations and positive thinking can be used to your advantage of course, but a critical expectation (“No, that won’t work”) can also negatively impact an otherwise effective strategy(2091). Thus, our **expectancies can blind us** to (other) potential avenues of improvement if we rely too much on our past experiences. For example, a tenacious belief about the necessity of Pre-Contest cardio may make it difficult to use cardio judiciously (e.g., not overdo it), and sabotage what could have been a more successful contest prep.

On the other hand, one should also recognize that **empirical, in the trenches knowledge may precede scientific investigation** historically. A famous example of science not matching “real life” as we know it now, and one I’ve seen misused as a knock on “scientists living in ivory towers,” is the 1977 ACSM Position Statement on the

Use and Abuse of Anabolic-Androgenic Steroids(168). The Position Statement reads, “There is no conclusive scientific evidence that extremely large doses of anabolic-androgenic steroids either aid or hinder athletic performance.” Naturally, that position statement has since been modified (somewhat(171)), and certainly **today** scientists know this not to be the case (169). However, what is often missed in criticizing the older ACSM document is that **in 1977**, that actually **was** a true statement, given the **then** currently available scientific literature and how those authors define “conclusive scientific evidence.” In other words, the authors’ conclusions were factually correct, at the time they were put forth, but many strength athletes knew the facts of the matter long before Western science caught up(2092, 2093).

5.2 Ways of Knowing – Authority (The Powers that Be Said So)

Unchecked acceptance of authority and statements made by authority can be a dangerous way to gather information. Authorities, if their contentions are to be valued, should ideally:

- Provide or be able to provide a rationale or **factual support** for what they say.
- Convey information, even if new and novel to the listener/reader in a way that's reasonably **understandable** (i.e., without intentionally speaking over the person's head).
- Provide **scientific references** substantiating claims of a **scientific matter**.

Authority - The Lay Press and Internet

In the United States, the lay press presents the public with a great number of medical developments(2094), but the press has been criticized as a poor source of scientific information due to sensationalism, biases and conflicts of interest, poor story follow-up and selective coverage of topic areas(2095). (You might ask whether you trust press releases relative to an area of your expertise.) In the internet's infancy, high variability in quality and accuracy of healthcare-related information might have been more of a concern(2096), as it seems that consumers may be a bit savvier these days (2097).

Still, there are minimal checks on the assertions (often made with great air of authority) that permeate blogs, message boards, or other forms of social media. The Internet is the epitome of a free-for-all when it comes to unchecked information dissemination(2098). Perhaps the worst symptom of this is intellectual theft: Plagiarism. Well over a decade ago as well as most recently, I encountered this as a college professor. The data support that I was not alone in finding cheaters who had plagiarized their writings from the internet(2099).

A simple way to check for plagiarism is to transpose a suspect text passage of the source writing into a standard Internet search engine (like Google). (For an extra challenge, try to sleuth out the original source of information when you come across a piece, such as a news article, that has been propagated repeatedly across the world wide web.) Unfortunately, plagiarism can run the other way, too –

from online (non-peer reviewed) sources into peer-reviewed journal publication. A recently published (peer-reviewed) article appearing in Nutrition and Metabolism(2100) contains a clearly plagiarized section from a well-known online site's discussion(2101) of the same topic (alcohol and muscle metabolism – see cited references for more information). So please take note: The Internet is filled with unchecked information, possibly corrupted after being passed along through multiple interpretations(2102), and sometimes plagiarized, further entangled by varying opinions about what constitutes “truth”(2103) and simply false reporting(2104).

Authority - Scientists

In an ideal world, scientists would conduct their research with computer-like objectivity. However, the scientists currently authoring today's body of research literature are indeed (still) humans, with human ambitions, greed and ego. Part of being human still entails slipping up now n' again and making honest to goodness measurement, statistical or other errors. Less palatable evidence of the fact that scientists are indeed human is the ability to hide a lie behind misused statistics(2105),” different than falsifying data *per se*, both of which I've unfortunately been privy to via research performed in the consumer products industry, as well as in academia.

It's worthwhile to look for conflicts of interest, e.g., grant funding from a supplement company to test one of their own products, when weighing the value of scientific information. Also, even if you're not formally trained as a scientist, examining the original publication (not just a publication abstract) can greatly improve your sense of the veracity of the evidence. Scientists are people who make mistakes and are subject to external influences that may color how their research results are presented in written form. However, applying a little common sense by taking a gander at the "raw" data (often found in the article only as means \pm standard error) may help you determine **practical** significance (applicability to your situation) vs. **statistical significance** (a matter of statistical methodology that may be irrelevant for you) (see below). Some features of scientific study you can use to size up a scientific study are:

- Subject characteristics (training status, age, gender, species, etc.)
- Dose of a given supplement/drug and means of administration (oral vs. injected).
- Experimental Design (what was done, for how long,

etc.).

- Relevance to how you would apply the information (the type of exercise, acute vs. chronic effects, the practical value of the size of the effect shown, e.g., change in muscle size, blood cholesterol level, etc.)

Authority - Experts/Authors

In my opinion, (expert) authors should *de facto* be put under higher scrutiny when making claims, rather than believed more readily because of their status. A particular “form” of the logical fallacy of “argument from authority” is that of *argumentum ad verecundiam*, which could be considered an argument from inappropriate authority(2088), whereby an authority’s claim is made outside his/her area of expertise. This can be especially tricky if you don’t know a person’s specific educational background. For example, some physicians(2106) provide nutritional advice despite admittedly lacking appropriate training in this area(2107). **Simply put, a person’s notoriety as an expert does not confer some sort of universal expertise that one should use as a basis for trusting that person on matters outside his/her area of expertise.**

Authority – Beware the Broscientist

The “Broscientist,” in case you don’t know, Bro, is a bastion of bodybuilding knowledge typically presented as undeniable scientific “fact,” but most often entirely unsubstantiated by any scientific evidence(2108). Typically, Broscience is what some guy heard from another guy that got passed along enough times to harden the information as incontrovertible proof in the Broscience archives (strewn loosely across the internet over the ages). One of my favorite Broscience “bodies of literature” concerns the effects of creatine monohydrate (CM) supplementation on muscle metabolism. It was very often put forth that CM supplementation raises resting muscle ATP concentration, which is clearly not the case (2109-2112). [Instead, stores of creatine and creatine phosphate are elevated, enhancing the use of creatine phosphate as a fuel during high-intensity bouts (2113).] The critical point here is that claims about resting muscle ATP concentration are clearly of a scientific nature, and thus the (bro)scientist would, to be most trustworthy, need scientific data to back up his claims. **Suspect Broscience when the scientific jargon seems thick and the citations are thin or non-existent.**

Authority – Beware the Anti-Scientist

As a final note on the topic of authority, you may also interact with **individuals who are very anti-science** in their stance, typically focusing on empirical experience and an "old school" (see red herring logical fallacy above) mentality. Note, however, that **often**, despite the suggestion by such anti-scientists that one doesn't need science to bodybuilding, **these individuals are relying upon scientifically derived information and technology** to bodybuild. The measurement of macronutrient and calorie counts of foods, the engineering science needed to construct resistance training equipment (and scales to ensure plate weights), and the basic paradigm [perhaps over-applied (2114)] of general adaptation syndrome(2115), which gives us the notions of periodization(2116) are all the products of science. Indeed, sharing in-the-trenches knowledge among weight trainers, from generation to generation is very similar to the "experiential learning (2117)" process that guides the forward march of scientific research. Thus, there is an implicit contradiction in eschewing modern, peer-reviewed western exercise science while espousing a "science-free, old school" methodology that is, in actuality, rooted in an empirically-derived "science" of weight training and inextricably tied to (sports and nutrition) technology borne of Western scientific investigation.

5.3 Ways of Knowing – The Scientific Method

Obviously, I feel there is much to be gained from the endeavor of (modern) Western science. Unfortunately, deep understanding of the scientific method is not typical in persons not trained or regularly exposed to this way of knowing, in my experience. [Still, I direct you to a recent update of the ISSN's Exercise and Sport Review which contains valuable perspective on evaluating the sports and dietary supplements, in addition to a review of quite a few compounds: [https://doi.org/10.1186/s12970-018-0242-y\(682\)](https://doi.org/10.1186/s12970-018-0242-y(682)).] I would like to cover two aspects of the scientific method that are especially valuable in keeping scientific finding in perspective:

- Practical vs. statistical "significance."
- External validity.

The Scientific Method – Significance, Validity and “Proof”

The probability level of 5% (or about 1 in 20 chance) as the criterion for statistical significance (that there is an underlying causative factor at work) is generally accepted, but essentially **arbitrary**(2118), traceable to a textbook published nearly 90 years ago(2119). Long before this, statisticians recognized that experimental tests may reveal practical (meaningful) group differences, even if this level of statistical significance is not met(2120).

Keep this in mind when evaluating research findings. A practical example in the context of bodybuilding might be changes in body fat percentage. If you ran the numbers in a particular weight class, there might not be a statistically significant correlation (Pearson product-moment correlation coefficient) between the conditioning (percent body fat) and the placing of competitors in a highly competitive bodybuilding contest, but the judges' eye sees these subtle differences as very **practically significant**. For a competitor who placed poorly, being leaner would likely have helped.

“**External Validity**” is a fancy way of referring to how well a study's findings can be generalized outside the confines of an experiment(2121), as opposed to “internal validity” or how well a study was constructed to be able to make specific (valid) conclusions(2122), whether relevant to the "real world" or not. Don't forget as well that studies often present only group means (or another form of central tendency, like a median value), rather than the full

spectrum of individual data points. Study findings can only serve a practical purpose for individuals (scattered about the mean), as the "average subject" is merely a statistical creation. So, as I noted above, looking over a given study (in its original complete form) with a common sense lens can often give the layperson a decent impression of a study's relevance.



On the other end of the epistemological spectrum, the notion of “scientific proof” whereby science can “prove” a fact has been perpetuated by the lay press(2123). It’s the realm of mathematics and logic, not natural science whereby one seeks to determine immutable, undeniable and omnipresent cause and effect factual relationships at work in the universe(2124). We commonly say things like "smoking causes cancer" when in actuality, smoking is a not a 100% guarantee of lung cancer and non-smokers do get this disease (2125). Research doesn't "prove" that smoking causes lung cancer, but simply tells us about the association of smoking with lung cancer (in terms of a statistical risk), as well as underlying mechanisms at work that make this association plausible. (For more in biological interindividuality, see [Chapter 2 Special Section on Hormonal Manipulation and Your Genetics](#).) Western biological science informs us about phenomena of the natural world, but does not “prove” the exact nature of these phenomena.

5.4 Final Thoughts on Being a Critical Thinking Coach

Obviously, time limitations preclude full vetting of bodybuilding authorities, scientists, authors, coaches et al., but if/when your philosophy or knowledge base rests substantially upon someone else's ideas, you might consider the following in choosing an expert or authority to trust:

- **Honesty:** Does the authority ever say, “I don’t know?” (Each person’s knowledge has its limitations.)
- **Creativity:** Does the authority have enough knowledge to creatively speculate when direct evidence is lacking?
- **Credentials:** What are his/her credentials? Who has the person worked with, trained under and/or coached? Where and what has he/she studied and is his/her academic degree relevant and from a real/appropriately-accredited institution?
- **Consistency:** Do the authority's opinions paint a consistent picture or a confusing and inconsistent one?

As a critically-minded coach, it’s also served me well to be open-minded to new ideas, assuming a “beginner’s mind(2126),” seeking first to truly understand from the other's perspective, before formulating a critique. This has made me more knowledgeable each and every time, and I hope this approach might do the same for you.

Chapter 6 – Frequently Asked Questions

There are naïve questions, tedious questions, ill-phrased questions, questions put after inadequate self-criticism. But every question is a cry to understand the world. There is no such thing as a dumb question.” –Carl Sagan(2127) I’ll answer these frequently asked questions in an *ad lib* sort of way, relying both on my personal experiences and opinions, as well as scientific support.

What Do You Have in Your Gym Bag, Scott?...

By no means are any of these pieces of equipment or supplies mandatory, but here is a list of the pieces of equipment I carry around, how/when I used them and/or my thoughts on how to use them:

- **Wrist Straps:** Used only if/when needed for working sets when grip strength is/could be limiting. Otherwise, they need not be used. I have a pair of traditional straps as well a set of “Lifting Grips” which double as **wrist wraps** and **quick release lifting straps**. These are very convenient for cluster sets (like **Fortitude Training®** Muscle Rounds). You’ll see me using these on my Instagram profile: https://www.instagram.com/fortitude_training/,
- **Knee Wraps:** I generally see a few reasons to **wrap the knees**. These days I rarely ever do so. (I’ve not wrapped my knees in years now, but did for many years every time I trained legs when doing DC training.)
Reasons to use knee wraps:
 - For performance - you’re stronger using them. This is more for powerlifters who will lift using this kind of equipment*.
 - Wraps help with **stability** and allow for greater loading*.
 - *As far as the above two, some feel that wrapping reduces **muscular loading**, whereas others feel they can load the target muscle better when wrapping. This is a matter of lifting style, purpose

(powerlifting vs. bodybuilding) and "ego" too: Some just want to lift as heavy as possible and/or feel that it's just more fun to lift the most absurd loads, even if it's not necessarily the best way to bodybuilder overall.

- Wraps have the above function and also help **prevent knee pain** in my experience, as long as wrapping reduces pain/irritation with lifting.
- One needs wraps **because of/to mask pain**: You'd not be able to train with certain movements/in this way (e.g., do heavy squats) without wrapping, at least not for many workouts. This situation is indeed where many have viable argument against wrapping the knees, as it seems doing so may perpetuate chronic arthritis by masking pain during what are actually injurious lifts. If you need to use knee wraps chronically to mask pain, you may be "asking" for chronic pain by your persisting in using a lift that you know full well isn't joint healthy for you (at least with the loading parameters you're using).

■ **A Lever-Lock Style Lifting Belt** (tapered 4 inch): Despite the occasional inconvenience of moving the lever-locking mechanism on these (as my waist size changes over the course of the year), I find the locking mechanism superior because: 1.) It won't come undone (unlike Velcro or plastic latching belts); 2.) It spreads belt tension across two prongs (vs. one on some prong-style belts); 3.) It allows for easy cinching and quick release. This latter feature means no time/energy wasted in putting the belt on for big lifts and quick freedom if one is breathing like a locomotive after a set.

- Whether one should wear a belt at all is of debate, although the research literature suggests it can do little harm(2128), increase intra-abdominal pressure and thus relieve spinal compression(2129) and may have ergogenic effects (greater loading for legs and back vs. spinal stabilizers) (2128).
- **I generally do not wear a belt during every set**, but only "save it" for use during my heaviest lifts (primarily for safety). Always wearing a belt could

deny the stabilizer muscles and erector spinae the training effect that makes for a rugged, conditioned midsection. On the other hand, a "blown out" torso and wider waist can be a genuine concern, especially if one trains later in the day/when consuming a large peri-workout recovery supplement drink that *de facto* means one will be training with some degree of abdominal distension. As with pregnancy(2130), chronic distension could alter the structure of the abdominal musculature and, combined with the hypertrophic influence of heavy lifting (e.g., deadlifts and squats), lead to a **"thickening" or "blown out" look of the waist** in some individuals. If poor habitual posture/neural control of the abdominal wall ("abdominal control"), likely brought on by eating copious amounts of food, predominates during the day, abdominal muscle length and structure could actually be (semi-)permanently altered(2131).

- **On the other side of the coin, waist training/corset training/using a squeem** to keep the waist small and/or reduce its size has become a common practice in bodybuilding, even among men. This practice has a long history(2132) and has more recently taken hold in the bodybuilding subculture. However, the potential risk of internal injury that comes with this practice(2132) precludes me from recommending it, but I have seen it be effective when used judiciously (e.g., with gradual tightening that doesn't rush anatomical conformation). Squeemer beware.

- **Climber's Chalk in a Bag (Grip Chalk):** This is better than using a block of magnesium carbonate, in that it can be more precisely and even **clandestinely applied**, which means you can get away with using it in gyms where making a chalky mess is frowned upon.
- **Powerhooks via www.Powerhooks.com:** These are used to "hook" dumbbells to an overhead bar (in a rack, on a bench or a Smith machine) to avoid having to pick the dumbbells up to initiate a movement. E.g., when connected to the dumbbells, the powerhooks could hook on to an Olympic bar racked on a flat bench such that flat dumbbell presses could begin from an overhead

position. (See website for details.)

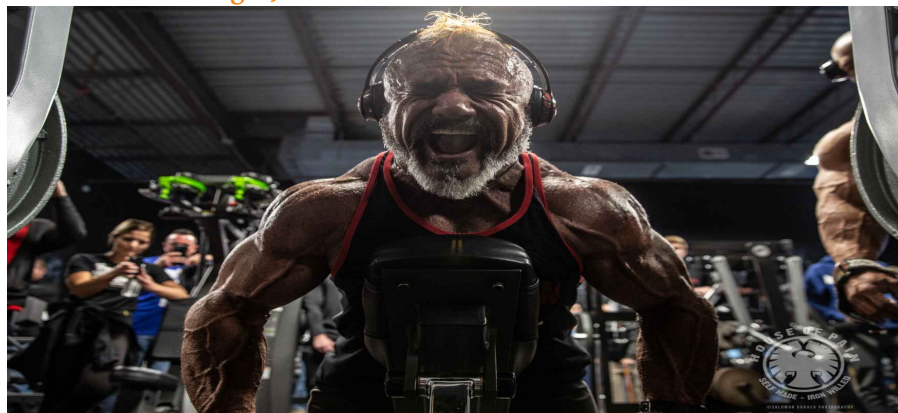
- **Daisy Chains from www.Ironmind.com and carabiners:** These have various uses, such as with their Ironmind Hip Squat Belt (Super Squats® Hip Belt), to extend the cable for ease of setting a load down between sets of a cluster set (such as a [Fortitude Training®](#) Muscle Round) and adding (hanging) extra load to various machines in unique ways. Additionally, largemouth carabiners can be had that fit around Olympic bars, as well. (See my [YouTube](#) channel for uses here.)
- **Extra Pins:** For adding plates to weight stacks. These can also be handy when doing drop sets if one doesn't want to have to deal with weight selection when in the throes of a diabolical set. I also use these to **pin plates to a weight stack** if I need to use a load greater than the whole stack. (You can also seek out weight posts that can be pinned to a weight stack that allow up to 3-4 plates to be added.)
- **Screw-Down Collars:** Because the spring collars of many gyms just don't cut the mustard, having your own set of (small) collars can be helpful, e.g., if a fully loaded bar or machine threatens to dump the outside plates mid-set.
- **Elastic Bands from EliteFTS.com:** I usually only tote a pair of the orange bands from the [Mountain Dog Band Pack](#) (John Meadows' product) there, as these are very versatile. I use them to:
 - Change the length-load relationship (**loading curve**) on exercises to better match the **strength curve**([2133](#)). For instance this would mean banding (the band adds load to the machine/bar, adding less load the lower the weight to the floor because the band is under less stretch) or "**reverse banding**" (band is attached above the load/bar, so that it removes load, more so the lower the load to the floor). In either case, there is less resultant load at the bottom of the range of motion. This, of course, works well for exercises like squatting movements or deadlifts make the exercise easier at the sticking point/weak point in the range of motion.

- To have a **convenient and simple way to add load**. In some cases, using bands or double-wrapping the bands can take the place of several 45lb (20kg) plates, saving time relative to loading those plates or allowing greater loading than a given machine would allow otherwise.
- Note here that some **gym owners may not take kindly** to you overloading machines in this way, but honestly don't recall a single time when I was asked to remove bands, even if/when I was doing so to exceed the maximal normal load for a given machine.

■ **Kwan Loong Oil:** See the answer to the following two questions for more on the use of Kwan Loong Oil.

What about the aches n' pains of training?... What do I do if I'm injured?... Can I train around injuries?...

The wear and tear of high level (competitive) bodybuilding is essentially unavoidable. Many of you either have or will find that you will spend much of the time operating at less than 100% in terms of musculoskeletal health. There will almost always be some sort of unwanted inflammation to address. Here is a list of some of the larger of the issues I've had in over 35 years of training. For what it's worth, none of these have kept me out of the gym, with my most extended break coming after overtraining (which I briefly chronicle in my book *Fortitude Training®*):



- Turf toe
- Shin splints
- Torn calf muscles (Multiple small tears that have added

up)

- Patellofemoral syndrome
- Hamstring tendonitis
- Multiple quad strains and minor tears
- Pulled adductor magnus (with visible hematoma)
- Groin pulls
- *M. transversus abdominus* tear and ischial bone avulsion fracture
- Displaced ribs
- Bicipital and supraspinatus shoulder impingement
- Biceps tendinitis
- Triceps tendinitis
- Bilateral triceps tears
- Bilateral biceps tears
- Bilateral Pectoralis major tears (small)
- Tennis and golfer's elbow
- Cervical spinal stenosis and degenerative disc disease.

Obviously, there can be **no cookie cutter answer** to address such a wide range of medical issues, but I'll try to outline a few orienting ideas, because this question is **very commonly asked**:

In addition to an allopathic (MD) or osteopathic (DO) primary care physician, you might consider seeing:

- A **Chiropractor** (DC), **Naturopath** (ND or NMD), **Physical Therapist** (aka Physiotherapist) or even an **Athletic Trainer** (ATC) in certain circumstances.
- A practitioner who is trained in **Active Release Technique** (typically a chiropractor or physical therapist/physiotherapist)
- A **Massage Therapist** who performs medical massage.
- A **Licensed Acupuncturist** who does Oriental Bodywork (Tui Na, Shiatsu, An Ma, etc.), especially one who is a martial artist/works on martial artists, as they will often specialize in musculoskeletal injury.

3.)

Common sense: Avoid any and all exercises or movements that cause or recreated the pain/issue either during or after activity. This cannot be overstated, as continually performing an irritating exercise is what has brought on many of the chronic overuse injuries that most of you will deal with regularly. A prime example is knee and back pain due to barbell back squatting, which, when “ignored” for years can lead to an inability to perform that exercise whatsoever.

Injuries that could resolve in a matter of a week might be perpetuated and worsened for months by refusing to work around the injury (via exercise selection) or just lay off a given muscle group. This a suggestion borne of "clinical" perspective rooted from decades of experience (it took me some time to come to my senses) and of observation of (similarly stubborn) trainees.

4.)

Take an active role in prevention and treatment. Sometimes the injuries that creep up on us are reminders that no one is getting younger and some preventative medicine makes sense, especially given how traumatic intensive weight training can be. (Consider the publicized medical histories of perhaps the greatest bodybuilder and powerlifter of all time, Ronnie Coleman and Ed Coan, respectively, and we have convincing evidence that pushing the limits takes its toll and that joint care is prudent.)

The gamut of joint care supplements is beyond the scope of

this book, but there are some deserving of mention, because of their usefulness and/or (current) popularity.

- **Glucosamine and chondroitin**, especially in combination(2138), may prevent joint (cartilage) degeneration(2139-2142) and reduce pain(2142, 2143), e.g., in Navy Seals (2144), but these effects are far from unequivocal(2145, 2146). (See [Chapter 7 Resources](#) for two forms of glucosamine/chondroitin with which I am familiar.)
- **Undenatured collagen type II** (e.g., 40mg of UC-II®) is a way to confer immunotolerance(2147) to this **essential protein component of joint cartilage** (2148-2152) and alleviate (osteo)arthritis in horses(2153), dogs(2154, 2155), and humans(2156), even if they have **healthy** joints that don't meet the diagnostic criteria for arthritis(2157).
- Literature has been mounting in the past couple decades suggesting that **collagen hydrolysate (CH; also known as gelatin, typically from bovine cartilage) supplementation** can positively impact joint pain(2158-2161). Animal models suggest collagen peptides can be absorbed intact, making their way to joint cartilage(2162) where they can play a role in extracellular matrix [where collagen is found(2163)] metabolism, including both collagen synthesis(2164, 2165) and breakdown(2166). A recent meta-analysis(2161) (where most studies tested 10g/day doses of collagen hydrolysate), the effect size for collagen hydrolysate for reducing osteoarthritis pain was approximately that of acetaminophen and half that of topical NSAIDs and oral glucosamine(2167). 24 weeks of CH (**10g/day**) supplementation in athletes reduced knee pain at rest and during activity, especially in those who reported knee pain at the start of the study(2168). Note that there may be differences in the effectiveness of CH products due to the extent of hydrolysis(2169), so **finding the right source of CH** may be paramount in producing an analgesic effect.
- **BCM-95 curcumin** is bioavailable(768, 2170) and

effective in my personal experience (when taken on an empty stomach) in alleviating joint pain (when taken in singular doses of 400mg), while 1500mg/day of **Curcumin C3 Complex®** [with black pepper extract to aid in absorption(1265, 1269)] can reduce pain and improve physical function in arthritis sufferers(1272, 2171, 2172).

- **Cissus Quadrangularis (CQ)** is used with success by many to help with arthralgia during periods of heavy training, but it has many other health benefits. Also known as veld grape, CQ is a houseplant used in Indian folk medicine to heal fractures(2173-2181), and in other cultures to treat, for instance, gastrointestinal disorders(2182-2185) and even hemorrhoids(2186). Cissus also has antioxidant and antimicrobial(2187, 2188), antiinflammatory actions(2183-2185) including the reduction of tissue infiltration by immune cells(2185), a hallmark of tissue injury, and similarly, analgesic (pain reducing) actions(2186). CQ contains high levels of Vitamin C and carotene(2188) as well as the phytochemical quercetin (2189), an antiinflammatory(2190), vasodilating flavanoid found in grapes(2191), and beta-sitosterol(2189), a cholesterol-based compound that also has antiinflammatory(2192) as well as immunomodulating (cortisol reducing) effects(2193) and possibly the ability to reduce glucocorticoid receptor expression(2194). A study with beta-sitosterol demonstrated that this constituent of CQ reduced the stress on the immune system as well as the elevation in cortisol brought on by running a marathon(2193), suggesting that beta-sitosterol and CQ may have an adaptogenic effect. CQ may also aid in body fat loss and improve related health parameters such as blood lipid profile. Oben *et al.* (2187, 2195) found that, compared to a placebo group, obese individuals taking CQ (600mg daily), with or without a formulation including green tea extract, lost bodyweight and reduced blood LDL ("bad") cholesterol, triglycerides and resting blood glucose. CQ also increased serotonin levels in the blood, which may have reduced appetite. Note also that CQ also increased as creatinine(2187), which

they suggest may reflect an increase in muscle mass(1377, 2196) (which was not supported by my calculation of fat-free mass changes using the reported body composition data), although this might also be indicative of (impaired) renal function(1375). Studies of CQ's effect on bone growth do however support the notion of CQ as an anabolic agent(2174).

- Lastly, I have found a topical liniment with antiinflammatory action – specifically **Kwan Loong Oil** – to be quite helpful over the years. I cover this in the question below.

I've seen you in one of IFBB Pro Dave Henry's videos putting a "magical" liniment on your knees... What gives?

This is **Kwan Loong Oil (KW Oil)**, a medicated topical, transdermal liniment containing methyl salicylate (MS; related to aspirin), menthol and camphor. I've found it quite effective to deal with nagging joint and tendon inflammation, used only to disrupt an insidious inflammatory cycle, but **not to mask a chronic (overuse) injury**. KW oil is my go-to topical antiinflammatory and has been for years. (I tested out a multitude of other formulations years back - which I mention in Dave's videos - and this one came out on top.)



Methyl salicylate (a nonsteroidal antiinflammatory drug or NSAID) formulations penetrate the (clean) skin easily (2197). While (oral) NSAIDs like salicylate inhibit the cyclooxygenase enzymes(2198) responsible for inflammation (prostaglandin synthesis) (2199), this could also blunt post-workout **muscle** anabolism(2200) and protein synthesis(1553, 2201), if overly large doses(2202) that elevate blood levels are used(2203, 2204). A hearty topical application can increase tissue concentrations 30-fold relative to that

in the blood plasma(2205), raising blood levels only to the same extent as two baby aspirins taken orally(2206), so this is likely not an issue if used moderately.

Camphor increases sensitivity to both heat(2207) and cold(2208), but is considered warming in Chinese medicine (this is how it feels to most people) and thus works well for warming up an area. (Note that camphor is toxic (2209, 2210) and its concentrations in topical applications are limited to 11% by the FDA(2211)). Menthol has a “cooling” effect(855) and does indeed sensitize to cold(2212), but in topical preparation, it increases both skin blood flow and muscle temperature (2213), thus also making it a good ingredient during a warm-up. [In my experience, menthol alone is a worthwhile ingredient in a topical pain-reliever.] FYI you will also find capsaicin in many topical formulations, but it seems to have variable(2214) effectiveness for pain reduction(2215). (I personally have not found capsaicin formulations helpful.)

Some research has suggested MS topicals are most effective in acute scenarios(2216), but the evidence is poor(2217). On the other hand, salicylate topicals can be powerful enough to relieve pain from muscle strain(2218) and have analgesic effects comparable to an oral dose of 650mg aspirin (2197, 2219). Take note here, though - this level of effectiveness can be a **double-edged sword** if one starts using topical applications to mask pain. The topical formulation should **not be a license to do exercises you know are irritating to a joint, tendon, ligament or muscle**, but rather to control inflammation while taking measures to permit healing and **deferring to licensed medical advice generally speaking**. [WARNING: Those taking anti-clotting drugs should know that methyl salicylate may amplify the effects of anticoagulants like warfarin (Coumadin), increasing the risk of excessive bleeding (2204, 2210).]

It's my contention and that of others(2220) to **limit the use** of a liniment like KW oil for a time period on the order of a week or so (see below). Injuries or aches n' pains that persist longer a day or two, much less a week, that haven't improved dramatically likely require **medical attention**. (A persistent injury while using KW Oil suggests that one might have been using it to mask pain instead of **limiting** the extent of flare-ups, whereby the goal is to continue regular training but also permit healing, i.e., “work around the injury.” Additionally, NSAIDs like salicylate can inhibit the normal increase in the collagen synthesis(2221) and thus the connective tissue strengthening stimulated by training(2222, 2223). Thus, chronic use of topical methyl salicylate does not bode well for complete healing and the possibility of future injuries to the affected area.

My clients and I have had good success applying KW Oil per a

schedule similar to the below (although each case should be considered independently). **The below does not constitute medical advice nor serve to replace proper medical attention.**

- **Week 1 Daily:** Apply and cover with neoprene sleeve 1-2 times per day with mild heat. Approximately 20 minutes per session.
- **Week 1 Before Training:** Another application as above (minus the heat).
- **The Following 1-2 Weeks:** Application only before training where aggravation is possible (i.e., the affected joint or tendon/muscle is involved in the exercises in training that day). Discontinue use as soon as possible.

Of course, again, the above would also take place in the context of **concurrently receiving professional treatment** for the injury, deferring the above to the advice and prescription of said practitioner.

I'm over forty and want to keep on pounding the iron and even making progress if possible. What are your suggestions as far as training?...

Firstly, Father Time will have his way with you, eventually, but this doesn't mean you can't enjoy the ride each and every rep of the way. You may not be able to train like madman as you did in decades past: The **hundreds of thousands of reps** (literally) will take their toll. Unleashing blind fury as often as possible or literally every time you train (like you may have in your twenties and thirties) might not cut the mustard anymore. Chances are your list of injuries overlaps with my list above, and you've got a few of your own novel kinks in the armor to boot. To work around these kinks, you'll perhaps need to strategize your training, introduce more variety, as well as truly listen to the signals coming from your body (auto-regulate).

Here are some **questions you can ask yourself – honestly** – to evaluate how you can change your training to keep banging away as much as possible

- **What exercises** can you realistically continue to do without incurring injury, aggravating old injuries, or otherwise debilitating yourself?
- Can you **modify** any of the above so that you can keep doing them (i.e., use box squats or a safety squat bar)?

- What **accessory equipment**, wraps, straps, belts, or even suits can you employ? On the other hand, is the use of accessory equipment perhaps band-aiding or perpetuating injuries and underlying structural weaknesses?...
- What kind of volume (sets, reps, and workout duration) can you realistically recover from?
- What is at the **root of your passion for lifting**? Do you like to feel/be strong? Is it the journey into no man's land (possibly committing one or more of the glorious Ps) that you love? How much of this kind of training can you honestly get away with?
- Do you believe that training over the age of <fill in the blank> must necessarily change, i.e., is there any aspect of your "aging" that is actually due to a self-fulfilling prophecy?

Given the above and the training modifications that present themselves in answering these questions, there are two other general training strategies you might apply if you've not already. Both of these are at work in Fortitude Training®:

- Make use of cluster sets such as Fortitude Training® "Muscle Rounds," as performed as [DoggCrapp Training's](#) rest-pause sets, or in other systems such as [Børge Fagerli's Myo-Reps](#). I cover the advantages of muscle rounds as laid out in [Fortitude Training®](#) in that book, so I'll leave you to that for more detailed info. The gist here is to provoke extensive muscular overload relative to the stress imposed on the nervous (autonomic and central), endocrine and immune systems by limiting points of momentary muscular failure, which in my experience are particularly taxing on these latter systems.
- Make use of **metabolic stress as a hypertrophic growth signal**([59](#), [60](#), [2224](#)) the underlying mechanism at work in blood flow restriction (BFR), aka occlusion training ([2225](#)). This mechanism is also targeted in Fortitude Training® Pump Sets. I'll cover this topic in detail below, and explain a method whereby one could introduce BFR without the use of a tourniquet or some externally applied compressive device (such as knee wraps). [The descriptions below are not explicit

exercise prescriptions, but rather strategies that have worked with clients, fellow bodybuilders (and myself).
Please apply common sense and recognize that you exercise at your own risk.]

Given enough volume(2226, 2227), training with light loads (reps ranging from ~20-35/set) and taking sets to failure (2224) can induce muscle growth(2228, 2229) equivalent to that of high(er) intensity training [~ 10 reps/set(1822)]. The key here is that you've got train relentlessly hard. As fatigue ensues and sets are taken to(wards) failure, any and all motor units that can be actively called upon, will be(2230-2233). So while heavy loads activate more motor units than lighter loads when starting a set, **taking a high rep set to a safe failure point** where effort is maximal, a tremendous growth stimulus can be had. The results of those religiously employing 20 rep squat regimens is a primary example of the brutal effectiveness of maximal effort, high rep training.

Invented in Japan, Kaatsu training(2087), aka blood flow restriction (BFR) training(2234)) or occlusion training(2225), is used to generate muscle growth but limit skeletal and joint loading, e.g., in rehabilitation or when training the very frail elderly(2087). Loads are very light and ($< 50\%$ 1 repetition maximum) and blood flow is restricted (blood pools in the capillaries) by using a ligature fitted proximal to the limb muscle(s) being trained. [Clinically and in research studies, a particular apparatus similar to a blood pressure cuff is employed, although knee wraps can be used as well (2235)].

The training **typically consists of several high rep sets (15-30 reps)** with short rest periods ($\sim 1:00$), but without relieving the blood flow-occluding external pressure during rest intervals. The metabolite accumulation set by set(2236) is impressive and the pain extraordinary. This metabolic stress creates an anabolic effect(59, 60) possibly via cell volumizing(2236, 2237). Also, as you might have guessed, the postexercise pump (reactive hyperemia) is ridiculous! [Interestingly, the hypertrophic mechanisms at work here are complex, in that ischemic preconditioning (several minutes of occluded blood flow before but not during exercise) protects against muscle damage (presumably by reducing reperfusion injury) (2238, 2239), and postexercise blood flow restriction (applied for 3 min at rest, just after finishing the last rep) may attenuate muscle growth, at least in wome (2240). So, it seems there may be some interaction between active contraction/force produce and the timing of metabolic stress in terms of the adaptive signaling.]

Metabolic fatigue shifts activation towards high threshold motor units when using light weights(2241, 2242). Satellite cells are called upon during low load, high rep training(496), as is the case

with high intensity training and other experimental models of muscle growth(2243-2249), and myostatin expression is reduced(2250). The data are essentially limited to studies to **untrained individuals**, but the research suggests that BFR training is an extraordinarily powerful hypertrophic stimulus(2087, 2234, 2251, 2252). In an extensive review of training variables that produce muscle growth (31), a two-week Kaatsu resistance training program (2253) (twice daily sessions) demonstrated the highest rate of quadriceps growth of all studies reviewed. Personal experimentation and conversations with others suggest that blood flow restriction training is effective in **maintaining size** in highly trained bodybuilders (e.g., working around injuries) and producing **noticeable growth in intermediate-level lifters**. When working through an injury the precluded heavy leg training, I used BFR to hold on to virtually all my leg size, and also shift my perspective as to how brutally painful leg training can be.

There are potential drawbacks, though. Yoshiaki Sato, Kaatsu training's inventor, cautions that Kaatsu training should not intentionally induce extreme ischemia(2254), as this may cause thrombosis(2087), as well as rhabdomyolysis (permanent muscle tissue breakdown) (2255). [These risks are less than 1 in ~1800 sessions in clinical settings in Japan(2084).] Kaatsu training seems to be tolerable even for the untrained under controlled conditions(2085), but because variation in the parameters of artificially restricting blood flow (constriction tension, duration of blood flow restriction, etc.) can increase risks(2256), **I still don't recommend it** as a general practice for increasing or maintaining muscle size.



There's no reason to throw out the baby with the bathwater: As it turns out, strict Kaatsu training (with a ligature or some sort in place) may not be necessary to create a blood flow restriction effect. As you could probably guess after training for years, during **continuous muscular contractions above about 50-60% of maximal effort**, especially with **slower rep cadence**(2257), blood flow is limited due to intramuscular forces(2258-2260). (Ever pause

in a middle of a set to let the burning pain subside?... Doing so also restores blood flow and waste product removal.) The impressive postexercise hyperemia – the much sought after, even orgasmic "pump" – that reveals itself just after a set of prolonged, continuous (non-stop) reps is tangible evidence of limited blood flow during such a set(2261). So, one way to create blood flow restriction without the complicating (potentially risk-amplifying) issue of occluding blood flow with external pressure, is to **maintain muscle tension between high rep sets by keeping it under tension by stretching it** and superimposing a small degree of (isometric) voluntary contraction as well. A sequence of sets employing this strategy could be something along these lines:

- Perform a **high rep set** (20-30 reps) with controlled, continuous tension using a VERY light weight (<50% 1RM)
- Maintain a **continuous stretch** for 1:00 between sets, contracting the muscle lightly if necessary to minimize blood flow. (The burn/pain in the muscle should be quite noticeable if blood flow is limited.)
- Perform **another set** of ~15 repetitions.
- **Repeat** the procedure of stretch/contraction to increase metabolic stress and minimize blood flow.
- **Repeat** for 1-2 more sets as above.

For someone who would like to introduce this strategy into his/her training, just a couple sets (with a lightly loaded stretch in between) should be enough to get an idea of appropriate load and safe way to use a stretch to limit blood flow between sets. The load should be almost embarrassingly light for these, such that you can perform quality, slow, continuous reps. One should be especially careful to stop the sequence if pain becomes intolerable or focused in a sharp, injurious way along a muscle belly, tendon or joint, especially when initiating a rep after a period of light stretching. (Persevere to train another day, injury-free, whenever possible.) As concrete examples, here are some ways one might employ to limit blood flow between sets of different exercises:

- Use the **knee extension** to maintain isometric quad contraction in the stretched position at the bottom of the range of motion during the interval between sets, being careful not overstretch such that the joint capsule is compromised.
- Set up a **pec deck** such that the chest muscles stay on

stretch (perhaps while holding a lighter load than what is lifted during the sets) between sets. (One would stay "in" the machine between sets.)

- Use **straps to aid in grip** while holding the load on a **pulldown** or **rowing machine** for an occluding stretch between sets.
- Maintain your hold on a biceps curl or triceps extension machine (muscle under stretch) between sets, **without putting the load down**.
- Perform a **bilateral delt stretch** between sets by grasping a bar behind you and squatting down to create an appropriate stretch.

Again, the stretches/positions one would maintain between sets for the above strategy should obviously **never** compromise a joint (e.g., create torque on a hinge joint outside the normal plane of motion of that joint). If you feel joint pain or tendon pain, rather than a burning sensation in the belly of the muscle (as during normal training), the stretch should be terminated of course.

It's my sincere hope that with "wise" training, injury prevention and early treatment, and a **diet** and a **lifestyle** that is "dead on" to promote recovery (us "old guys" can't cut corners as we might have when we were in our twenties), I'll be writing and you'll be reading future updates to this FAQ addressing how to keep kicking ass in the gym in our 50's, 60's, 70's, 80's and beyond!

Can I gain muscle when in a caloric deficit (losing body fat)?

It's certainly **possible** to lose body fat and gain muscle mass at the same time. This is not an uncommon finding in resistance training studies using untrained subjects(2262). Unfortunately, just as the law of diminishing returns dictates that muscle growth is excruciatingly slow (or virtually non-existent) in highly trained bodybuilders (2263), some muscle loss is likely when a caloric deficit is introduced(7, 8, 1905, 2264, 2265), which of course removes fuel for anabolism and diminishes the anabolic hormonal milieu produced by caloric excess(2266).

Of course, if a pharmaceutical using (e.g., AAS, insulin, etc.) bodybuilder were to introduce such compounds (only) about the time Pre-Contest dieting commences, it's not uncommon to find that a **repartitioning effect** (loss of fat while gaining FFM) can be had. In essence, just like the novice weight trainer is adding a novel stimulus

for muscle growth and can thus gain muscle and lose fat, pharmaceuticals with anabolic properties can elicit the same effect. Still, this would (hypothetically) depend upon the development of a given bodybuilder, such that again, the law of diminishing returns would create a ceiling effect when it comes to attaining (new) muscle mass. In other words, the greater the muscle mass one has, the less likely such a repartitioning effect would be.

Those bodybuilders who make seem to transform each year (IFBB Pro Kevin Levrone's ability to do this has become legendary) are also likely taking advantage of a muscle memory phenomenon brought on by: 1.) Myonuclei previously attained(41, 42); 2.) Epigenetic phenomena that enhance gene expression in response to hypertrophic stimuli(38, 196); and 3.) Experience in training, diet and discipline that far exceeds that of any untrained "newbie," meaning there's practically no learning curve in figuring out what strategies work best for putting on muscle mass. [In other words, it's likely that if IFBB Pro Kevin Levrone had a (genetically) identical twin who had never trained, that Kevin's experiences in "growing into a show" would be even more apparent if the two brothers compared progress from the same untrained starting point. Kevin's previously highly trained state and know-how in putting on muscle mass would give him a distinct advantage over his "newbie" twin.]

How much weight should I gain in my Off-Season?

This question has largely been addressed in [Chapter 1](#) where I cover the goal of moving up a weight class, but I wanted to address this notion here, due to its grand importance in the bodybuilding scheme of things. Off-Season weight gain should take into consideration the following, at least (as noted in Chapter 1):

- How readily (**quickly**) can you drop body fat (and not lose appreciable muscle mass).
- **How long** will you have to diet (to lose the fat you have)?
- “Newly” gained muscle in the Off-Season is most easily lost Pre-Contest. I’ve seen this in both clients and myself [and wonder if it’s related to hypertrophy *sans* myonuclei addition that is not maintained without this mechanism of muscle memory in place(42)]. **Will a crash diet undo any muscle improvements you have made, given this proclivity to first sacrifice the most recently obtained muscle mass?**

- If you know you'll lose some size, how much muscle mass will you have to gain to offset the amount you tend to lose (or gain) during contest preparation?
- Are you **moving up** a weight class (or attempting to do so)? How much time does this take?
- Your **overall size/weight** (will you be a Lightweight or a Superheavy?)

I cover in [Section 1.3](#) how one can use body fat indicators (skinfolds) and estimates (DEXA, for example) to develop an Off-Season goal and reasonable expectations. Practically speaking, however, the **psychological mindset of the typical bodybuilder favors a leaner physique**. In other words, no one wants to get fat, and bodybuilders tend to have a different idea of what "fat" means, which may even be considered clinically pathological(78, 80). Muscle dysmorphia (or "bigorexia") may also share psychological roots with eating disorders(77), meaning that gaining muscle mass, as well as body fat is "playing with (psychological) fire" in someone predisposed for these kinds of psychiatric issues.



Putting aside potential psychiatric issues, I have found that most clients have an "upper limit" to body fatness dictated by a personal ideal. In other words, **self-esteem, body image, and sense of physical attractiveness can suffer if one gets too "out of shape."** Additionally, one may have **medical concerns** (that may or may not appear via diagnostic tests such as blood work), digestive issues from "force-feeding," and the physical discomfort (and often water retention, possibly accompanying loss of insulin sensitivity – see [Section 3.7](#)) that accompanies carrying a (food-and training-induced) extremely high body mass index can set off **warning lights in one's psyche**. So, for both unconscious and conscious (biopsychosocial) reasons, **one's personal upper limit in terms of body fat often sets the practical limit when it comes to gaining muscle mass**. I have

the impression in working with clients that there can be some self-sabotage that occurs near this upper limit, such as missed meals and the search for reasons (excuses) to adjust the diet. We know from placebo studies of human performance that there is an interaction of psychological conditioning and expectancies with physiological function(2267). ("Where the mind goes, the body will follow."). So, it's not surprising that a bodybuilder who dislikes the physique he/she sees in the mirror, does not feel well, and has health concerns might lack the motivation to gain even more body (fat) weight.

So I got a bit “fluffy” in the Off-Season. What can I do about this?...

Well, if you've reached your limit such as this (e.g., by being too aggressive with food intake post-competition), then a period of dieting to lose body fat and restore psychological well-being is probably in order. This could last for several weeks or several months. Perhaps the most important thing is to **learn from our mistakes**.

- Did I go overboard/push too hard during my show prep and "rebound" badly?
- Could I have managed the post-contest period differently?
- Have I included any kind of “togglng” of my caloric intake (See [Section 3.3](#) and [Section 4.5](#))
- How can I prevent this from happening in the future?
- How healthy is my relationship with food?
- How healthy is my body image (see also [Section 4.4](#))?

As you might imagine from the questions above, filling out another Personal Bodybuilding Inventory (see [Section 1.1](#)) with a focus on addressing why and how one ended up (prematurely) at one's personal body fat limit could make for a **very important lesson** that even supersedes one's identity as a bodybuilder and provides personal insights that last a lifetime. As always, **don't hesitate to seek out professional help** should you feel you need it to address such matters.

How much weight should I lose Pre-Contest? What about dropping down to make weight a weight class limit?

The answer to this, of course, will depend on a host of factors (as with nearly everything in bodybuilding)...

For bodybuilders, all men's (classic or otherwise) physique competitors and probably women's physique competitors – where the lower the body fat, the better – all other things being equal, the amount of weight lost is primarily dictated by **the endpoint of obtaining true stage-ready conditioning**. Thus your body fat starting point (at the beginning of the Pre-Contest period) will determine how much weight you have to lose or will have lost when it's all said and done (right). For lighter competitors who start their Pre-Contest diets in single digit body fat percentages, this might mean only losing 10lb or less. (A 150lb man who starts at 9% BF and retains all his fat-free and muscle mass would weigh ~142lb at 4% body fat, a loss of only 8lb.) A larger competitor (superheavyweight bodybuilder) who carries relatively more body fat in the Off-Season might end up losing 40-50lb to be lean enough on stage. He might lose 8lb in the first week to 10 days, much of which is water weight, lost from cleaning up his diet (see [Section 4.1](#)).

The amount of weight that will be lost, keeping in mind that one wants to **retain as much muscle mass as possible** is also a **function of time**, of course. Ideally, the process of dropping fat happens slowly enough to retain all the muscle mass you gained in the Off-Season, but doesn't take so long that the Pre-Contest period precludes a productive Off-Season. If you start dieting too late and you want to be in shape on stage, then you may have to bit the bullet and sacrifice muscle mass to be ready contest time. As mentioned in an FAQ answer above, one can actually gain muscle when losing body fat if the conditions are right for it (but I wouldn't count on this...).

Given time and (financial) resources, planning a **“warm-up” show** before the main competition(s) of the season is not a bad idea. This ensures that you're ready a bit early (no one wants to present him/herself on stage when obviously out of shape) and gives you a chance to practice Peak Week adjustments. (See [Section 4.8 Peak Week](#) – a warm-up show can function as a practice run for peak week.) Often warm-up shows are actually needed if one must re-qualify for a more prestigious event [e.g., acquire national qualification before competing in a (pro qualifying) national level event].

And then there's the **weight class dilemma**... Athletes who are very near a weight class limit are often faced with the choice of perhaps sacrificing a bit of muscle mass (and presenting a lesser physique because of this) in order to gain a weight class victory or even qualify for professional status. Here are a few questions you can ask when making this call:

- Will I **unacceptably risk my health** in trying to drop down to make weight?
- Will I **improve my conditioning** by dropping weight (and thus present a tighter and better physique)?
- Will I **sacrifice so much muscle mass** that I will actually place worse in the lighter weight class?
 - Will the **balance of perhaps better conditioning with less muscle mass** be an improvement over merely dieting into the show, weighing in wherever one might end up?
 - Will making weight **put me in a less competitive weight class**, where I perhaps will fare better and is it worth it? A better placing could mean the difference between acquiring qualification to compete at a higher level, e.g., national qualification or even earning professional status.
 - Will **staying in a higher weight class** help my placings? It's not uncommon at "state level" bodybuilding competitions for the middle and light-heavyweight classes to be the most competitive, such that being a heavyweight or super heavyweight, all other things being equal, would mean an improvement in placing.
- Do I have a **weight class limit** I must meet in order to compete in my chosen division?... This is the case with the Classic Physique (or Classic Bodybuilding) divisions (see below).

Of course, with the growing popularity of “**Classic Physique**” in the US [in the National Physique Committee(2268)], a division that has long existed in the IFBB as **Classic Bodybuilding**. At the time of this writing, these weight classes are greatly in flux, i.e., adjusted at the amateur and professional level to allow for more muscle mass. For some, the limits imposed upon muscle mass by the height-weight categories of Classic Physique/Bodybuilding may make the decision for you. [In my case, for instance, as of this writing, the NPC Classic Physique weight limit(2268) at my height (182lb for those >5'7" up to 5'8") would require me to drop 30+lb of stage weight, which I am certain would mean presenting a lesser physique.] For others, as I believe was the intention of these divisions, the weight limits automatically restrict some of the health-threatening practices of bodybuilding, e.g., force-feeding and drug use, making the endeavor

(ideally) a more healthy pursuit. On the other hand, by limiting body size, one *de facto* limits muscularity, perhaps the defining feature of **bodybuilding**, thus placing a greater emphasis on conditioning (low body fat), symmetry (which is a function of the skeletal structure which is in all likelihood less amenable to the effects of training), and perhaps presentation (posing). [Curiously, perhaps for cultural reasons, e.g., to “sell” the division to a larger audience in the context of Western social norms and prejudices against bodybuilders(2269), the NPC Classic Physique division mandates posing “shorts(2268),” which cover the glutes and thus obscure what many judges often look to as the most obvious indicator of low body fat. This division mandate could also be a way to “lower the barrier to entry” in the sport, i.e., allow less experienced (and less conditioned competitors) to compete (and pay entry fees) without a conspicuous lack of extreme conditioning. This rule seems just as contradictory to the nature of competitive bodybuilding as it would be to require that custom “muscle cars” being judged in competition be partially draped to conceal a key feature of workmanship.]

If you do **drop water to make weight**, e.g., using the approach I outline in **4.8 Peak Week**, **how you would proceed to optimize your look after weighin** would depend upon the time between weigh in and stage appearance. The possible **scenarios here are endless**, but **generally**, the steps would include the below. (Note that you'll probably have to read the section **4.8 Peak Week** to fully understand how to apply these guidelines.)

- **Practice your strategy with a peak week mock/trial run.** The important part here is to have charted the course of (water) weight loss on a daily and even hourly basis, so that you can **predict weighin weight from weight earlier in the week** and during the days preceding the weighin. (E.g., if your practice run weight log reveals you'll lose 5lb in the 12hr between midnight and a high noon weighin, and you are exactly 4lb over weight at midnight before weighing in for the actual show, you should make weight by just about one pound!)
- If time permits, **weighin somewhat glycogen depleted**, so that the carbing up process can help ensure water is stored intracellularly. (You may have no choice but to wait until after weighin to carb-up.)
- In the vein of the above strategy, you may be able to manipulate water using your typical repertoire of strategies simply as **if the weighin were a prejudging**,

with a focus on dryness (not fullness). Thereafter, you would adjust food intake (perhaps even use a “shitload” method) to fill-up, in much the same way you would to improve for Finals after a Prejudging.

- Similar to the above, simply use the “**Advanced Loading Strategy** (Loading after WeighIn)” (adjusted as needed to the schedule of your competition) explained in detail near the end of [Section 4.8 Peak Week](#).
- In general, **restore water (carbs/food and sodium) gradually as needed**. Use the bodyweight records during your practice run to determine roughly much water (weight) and how fast to add it back in. If, during the practice run, you think you might not have filled up optimally by the time your mock show day hits, continue to pay attention during the rest of this day. (Don’t stop the practice run just because you’ve finished the practice prejudging **if you can reasonably hang in there and not risk your health**. You’ve put your body into a very unique position to see how your respond to manipulations of water, sodium and various foods, so make use of this time to learn as much as possible.) So, this would a good time to continue to add back water, food and/or sodium to estimate how much more aggressive you can be with these elements during the week of the show itself. (E.g., if two more liters of water has a magical effect on your physique after the mock prejudging, this suggests that consuming about 2 more liters of water **before** prejudging would improve your look. The same reasoning holds for successful effects of food, sodium and other manipulations you try out that could be employed before, rather than after prejudging.)

I hear people talking about metabolic damage from dieting too hard or too long. Is there any truth to that?

This is an interesting topic that I’ve addressed indirectly in [Chapter 2](#) in referring to the propensity to potentially gain (back) body fat quite rapidly when one is leaner Post-Contest(70). First, a definition of metabolic damage is in order, as confusion about this matter may merely lie in what one understands "metabolic damage" to mean. Metabolic damage has been **defined** as a “weight loss induced decrease in resting metabolic rate that is beyond the value expected

from the present body composition and persists after weight regain(2270)". The key notion here is that metabolic damage is a function of one's **expectation** (based on a scientifically derived prediction equation), and not something that (as of yet) has been defined with distinct metabolic markers of "damage." So, I'll take a more global view of the topic and examine (briefly) what's happening metabolically and why one **might have the sense** that one's metabolism that is "broken" after dieting down to really low body fat levels. The **perception** of a "damaged" metabolism might originate in several ways:

- One has the sense that resting metabolic rate (RMR) is lower than **expected** (or perhaps hoped) because of the Post-Contest accumulation of body fat despite low caloric intake(2270-2272).
- The **calories** needed to maintain body weight (and presumably body fat) at a given body composition (weight and percentage body fat) during the Post-Contest period **are lower than in the past**(2273).
- **Prediction equations** suggest that RMR should be higher given a current body composition(2274), a measurement possibly confounded by the effect of adiposity on equation accuracy(2275, 2276).
- After returning to pre-diet caloric intake, **one ends up with more body fat**, a concept that's been termed "fat overshooting"(67, 68).

In addressing the above possibilities, it's important to note that different components of the body, most notably the fat-free mass (FFM), with some contribution by the fat mass, sum to give the resting metabolic rate (2277). However, as body fat changes, the **relative** metabolic rate of the FFM may go up (and vice versa)(2275, 2276), whereas the relative metabolic rate of the body's fat mass may follow an inverted U relationship with body fat(2278), which may confound studies relying upon RMR prediction equations. The concepts of the **adipostat** and **proteinostat** as co-controllers of both appetite and metabolic rate have been put forth to better conceptualize how RMR can vary with body composition (2273).

So, when body weight has been and remains reduced by a restrictive diet, energy expenditure will typically be lower due to adaptive thermogenesis (an intrinsic slowing of RMR)(2270-2272), which is accompanied by persistent hormonal changes(72), and very possibly a reduction in our old friend nonexercise thermogenesis (NEAT)(1834), unless you're careful to maintain activity in the face of

Pre-Contest fatigue. Indeed, a reduction in RMR may occur even if FFM is mostly preserved(2279) and formerly obese subjects seem to have a slightly lower than expected RMR compared to lean controls(2280).

The famous **Minnesota Semi-starvation Experiment** has informed us a good bit about variation in RMR during substantial changes in body weight and fat(2281). A recent reexamination(2270) of this study confirmed that there was some degree of adaptive thermogenesis during semi-starvation, but that the increase caloric intake during refeeding dictated the extent of the expected(2271) restoration of metabolic rate. Eventually, given enough time and food – 20 weeks after semi-starvation with the last 8 weeks of being **ad libitum** eating – the experimentally measured RMR matched that predicted by several equations(2278, 2282, 2283).

However, these prediction equations may be flawed in the context of previous weight fluctuation(2276, 2284). The rubber met the road at the end of the Minnesota study, when, although both RMR and FFM were both restored to pre-dieting levels, **body fat was indeed higher than before semi-starvation**, which has been called “fat overshooting”(67, 68, 2273). **Fat overshooting** has been observed in several studies(69), and may even involve adipocyte hyperplasia(71). When the Minnesota subjects were finally free to eat as much as they wanted, **caloric intake skyrocketed**, and body fat mass ended up >50% above pre-semi-starvation levels (67, 68, 2273, 2281). In other studies of this nature, the refeeding **P-Ratio** [or “partitioning ratio” reflecting the protein deposited as body tissue in the FFM relative to energy intake(2285, 2286)] is inferior to that seen when dieting down (and highly variable), and subjects typically continue eating beyond pre-dieting body weight(69). In other words, subjects hold on to FFM (muscle mass in part) better when dieting down compared to when eating back up, and, in these diabolical studies, add fat more readily and will often eat themselves to a higher level of body weight and body fat on the way back up.

A retrospective study of athletes in weight-cycling sports (boxing, wrestling, etc.) suggests that a history of weight cycling may promote obesity (a higher BMI) in middle age (relative to their athlete peers, but not compared to sedentary folks (2287). Similarly, a Finnish study of monozygous twins found that those who intentionally, repeated lost and regained body weight were more likely to be heavier decades later than their more bodyweight-comfortable siblings(2288). Of course, these studies don’t control for psychosocial factors that might connect weight cycling early in life with body image (and thus weight-regulatory behaviors) when one is older. This interaction is captured in the “**settling point**” model of body fat regulation, that

includes psychosocial and environmental input (dictating eating and activity) into the biological regulation of adiposity(2289). Of course, **epigenetic modifications** that constitute a “fat memory” could accumulate over time in response to repeated exposure to weight loss, adaptive thermogenesis(2290) and/or one’s diet(2291), and thus modify body composition changes in response to energy supply.

You may be thinking now, “Well, Scott, **doesn’t exercise have something to do with it?... “** Very likely, of course. A 6 year follow-up with participants in the TV Show “**Biggest Loser**” found that most of them had regained nearly all the weight lost during the 30 week show, strongly suggesting they failed to adhere (completely) to the outrageous exercise regimens when on “the ranch”(2292), and that RMR was **still** depressed to post-show levels, and below equation predictions(2274). They had **regained only about half of the FFM** lost during the diet at the 6-year mark (2274). On the other hand, a study of collegiate wrestlers(2293) and case studies of (natural) bodybuilders(7, 2265), all **maintaining vigorous exercise regimens**, suggest no persistent, relative [measured or predicted(2270)] slowing of RMR as a result of dieting down to low levels of body fat.

So, as with many topics in this book, we’re left juggling a multitude of variables in explaining a perceived phenomenon, and the list doesn’t stop with the above discussion. It’s very common Post-Contest to want to pull the emergency brake on the “crazy train” [Pre-Contest diet, (over)training and supplement regimen], and restore normalcy as soon as possible. If we consider a worst-case scenario of someone who fails

Metabolic Damage?...

What is it?

AFTER DIETING - Resting Metabolic Rate remains depressed even when body mass is restored?...

Associated Phenomena

- Adaptive Thermogenesis does occur, which can be mistaken for "damage"
- Re-feeding partitioning ratio is poor (looks like "damage")
- Fat "Overshooting" may occur (definitely looks like "damage")
- (Post-Contest Training might be the answer!)

What to do?

Transition Slowly from Pre-Contest

- (Possibly Diet back down if needed...)
- Ramp Cardio down
- Slowly remove Fat Burners, Etc.
- TRAIN if at all possible...
- "Reverse Diet" in some way (Ch. 2)

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to transition slowly during the Pre-Contest period (as discussed in **Chapter 2**), you can imagine how this might end up being perceived as "metabolic damage:"

- One abruptly gives in to hunger and lets loose on every buffet within a 100-mile radius.
- Feeling overtrained, cardio is abruptly discontinued, and one decides to take a week or two away from the gym (which in and of itself isn't a bad idea).
- One immediately drops all fat-burners, supplements,

and/or drugs that inhibit appetite and/or increase metabolism, shifting caloric balance abruptly upward. Discontinuing caffeine, for instance, may cause water retention(2071) and leave one feeling tired(1806, 1848), thus decreasing energy expenditure even more and worsening the ballooning caloric excess.

- If one doesn't consider all of the above in context, the rapid fat regain could **easily be mistaken to represent “metabolic damage.”** This situation could also lead to the “abstinence violation effect(81)” whereby “falling off the wagon” of contest prep leads to a complete collapse of the structured behavior of the Pre-Contest period. This, of course, could be accompanied by denial (2294, 2295) and an even greater sense that “metabolic damage” may be the culprit. (You may know the rest of the story...)

The solution of course, in being your own best coach, is to be prepared for the Post-Contest period, and consider it just as important as the other periods of the competitive bodybuilding year. For more on this, I refer you back to [Chapter 2](#) covering the Post-Contest period, of course.

What about the women competitors?... Is this a book for women, too?

A very important topic! In essence, an alternate version of this book could be written for women, which would include many caveats to address sex/gender-based differences. Paradoxically, research in the exercise sciences has focused on using single gender subject groups [mostly male (1972)], due to the differences between men and women that can confound outcomes, and thus neglected in large part to study women. Even conventional nomenclature that would differentiate the use of the terms “**sex**” (typically presumed binary due to genetic/chromosomal differences, resulting in males and females) and “**gender**” (a social construct that gives rise to women, men, and sometimes other genders, depending on the society) is not adhered to uniformly in research when selecting and describing subjects(2296, 2297) [and sometimes subject gender/sex is not even specified(2298).]



Indeed, parameters of biological sex (chromosomal, gonadal, hormonal, internal reproductive structures, external genitalia, and “brain”) have been put forth in the context of intersex individuals (who may vary from the chromosomal XX/XY dichotomy)(2299, 2300). At either end of the spectrum, it’s possible that chromosomal XX individuals to sexually differentiate as men(2301, 2302) and women may be genetically XY (due to androgen insensitivity, for instance)(2303, 2304). (Generally, here, for the sake of simplicity, I will use the terms “men” and “women,” as the large majority of research, unless specifically examining genetics, use self-reported gender to distinguish subjects, even if the studies themselves use the terms “female” and “male.”) These shades of gender and sex aside, research has to some degree ironed out how women and men are different, and my (admittedly relatively limited) experience with women competitors generally supports both differences and a large degree of interindividual variability among women. A comprehensive "Women's Book" covering the topics of physiology, nutrition, fat loss and muscle gain has recently been written by **Lyle McDonald**(2305) (See [Section 7.2](#) for Resources), so I generally direct you there. It’s important to note that biological interindividual differences lie on a **spectrum** that spans genders. One could conceptualize the range of nearly any of anatomical attribute or physiological response or adaptation as manifesting as some variation of a bimodal **distribution curve with peaks for men and women**. Additionally, the differences between men and women also vary across the lifespan by stages of development (e.g., childhood, adulthood, etc.), according to reproductive status (e.g., relative to puberty, menopause, and "andropause"), and, in the short term (approximately monthly), according to the phase of the menstrual/ovarian cycle in women (see Figure below). So, at most certain risk of not doing the topic justice, I'll hope that listing some (and **certainly not all**) differences between women and men might broaden your perspective on bodybuilding and "gender"differences. In keeping with the structure of the book, I'll

loosely group them according to three Periods (pun intended) of a competitive bodybuilding year:

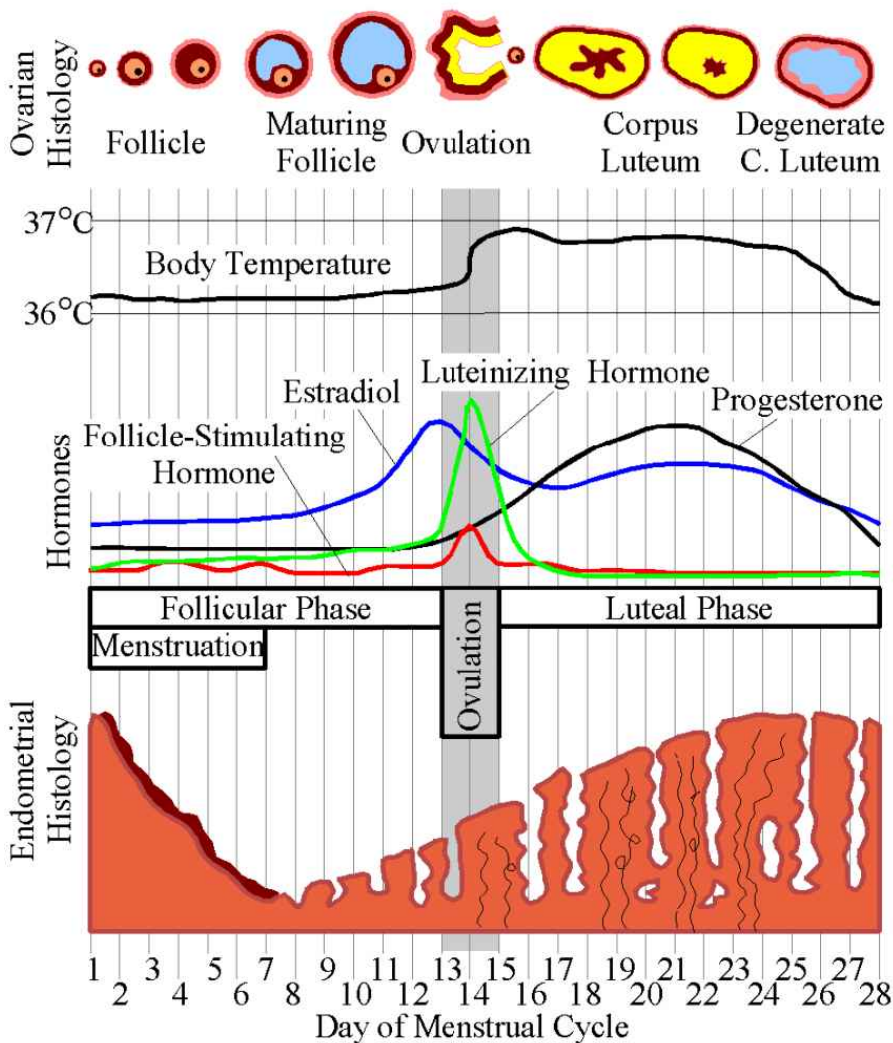
■ **Post-Contest:** Reversing a Pre-Contest diet comes into play and the mind games that come with gaining body fat after months of getting lean can start manifesting. The importance of this transition period, from a psychological as well as physiological (bodybuilding progress) standpoint, is why I've conceptualized it as a **separate Period**, and devoted such a significant portion of the book the time after one's finished competing but not quite in full-blown Off-Season.

- Psychologically (and depending on one's society), body image is different, of course, for women, who may be more likely to **perceive themselves as overweight**, seek out weight loss strategies(2306) and have more food-related conflict (2307). Obesity prevalence is higher for women than men(2308). **Being honest** with your coach (yourself!) about these issues is paramount to psychological health.
- Rates of **eating disorders** in women are higher than in men(93, 2309), and it's important to note that subclinical disordered eating lies along a continuum(1851). As I've mentioned before, clinical muscle dysmorphia is an issue for male bodybuilders(78, 80) and one study found male bodybuilders (not diagnosed with dysmorphia *per se*) to have "body uneasiness" roughly equivalent to that of female control subjects, but not as great as ballet dancers(93).
- The internal battle with gaining back body fat after a competitive season seems to be a tougher one, on average, for women compared to men. **Bikini and Figure** divisions, where there is less of a premium on muscle mass and leanness, can create a **psychosocial double-edged sword**: The pressure to diet down to extremely low body fat or push body weight up to gain new muscle is less, but because the physique standard is more easily attainable, the temptation to stay "contest ready" year round can promote **excessive training** and **restrictive dietary practices** (not to mention drug use) that are both unhealthy and incongruous with improving one's

physique.

- **Off-Season:** Where the primary goal is typically to improve one's physique by gaining muscle while keeping body fat within one's comfort zone and shooting distance for a reasonable Pre-Contest diet.

- Women may be **more fatigue-resistant** than men depending on the exercise task(2310). The topic of sex/gender difference in **pain perception** (threshold being the magnitude of a stimulus that evokes the sensation of pain, and tolerance referring to the maximum tolerable stimulus) has been investigated increasingly over the past 20yr (2311), with mixed results as to differences(2296, 2311, 2312). Some literature (but not all) suggests that **gender roles** (exploited by comparing responses to experimenters of the same and opposite gender of the subject) may impact **subjectivity**: The perception of pain (or at least what is reported) is diminished when reporting to/in the presence of someone of the opposite gender(2296, 2311, 2312). **Perhaps this explains why men and women very often make great training partners?**



(Average values. Durations and values may differ between different females or different cycles.)

Figure 16: The menstrual cycle, courtesy of Chris 73 (Wikimedia Commons).

- Menstrual cycle variation in hormones (See figure above) changes physiology over a ~28-29 day period [although **there is substantial variation in cycle length(2313)**]. Regular cycling may come and go, depending on energy availability(2314), which of course can vary substantially over the course of a competitive year if diet varies from an Off-Season caloric surplus to a deep Pre-Contest deficit. [As an aside, amenorrhea is associated with

bone loss and disordered eating in women athletes, commonly known together as the **female athlete triad**(1851, 2309).]

- Oligomenorrhea (infrequent menstrual periods) aside, research is largely mixed regarding the influence of the menstrual cycle on exercise performance (2315). Still, some data (and perhaps your experiences) point to the possibility that having a regular menstrual cycle can mean, **for instance**, changes in **knee joint laxity**(2316) (higher in the early luteal phase), which may predispose to injury(2317), greater strength mid-cycle(2318), **changes in testosterone** [higher in the luteal phase(2319)], which correlate with muscle gains in the short term(2320), reduction in muscle soreness when estrogen levels are higher(2321), possible changes in **thermoregulatory**(2322, 2323) and other **physiological responses** during endurance exercise(2324, 2325), and **aerobic power** that may dip down during the luteal phase(2326).
- On top of this, **hormonal contraceptives**, depending on formulation and route of administration (oral vs. injectible), can have varying effects on female athletic performance(2327), body composition(2328) and muscle soreness(2321).
- Of course, men have more muscle mass (on average) and distribute that more so in the upper vs. lower body(2329). In an exercise physiology lab I used to teach in my professorial days, **lower body strength tests** comparing men and women, expressed relative to body mass, resulted in a gender tie almost every time, which fits well with published research findings(2329-2331). This lack of gender difference also holds true for some tests anaerobic power, especially performance output is expressed **relative to fat-free mass**(2332).
- Women tend to have smaller muscle fibers, especially of the Type II variety(1580, 2333, 2334) [which may explain greater relative fatigue resistance(2310)], but the same density of satellite cells(2335), which suggests women aren't several

compromised in terms of muscle growth(498).

- **Relative** changes in strength and muscle (fiber size and whole muscle CSA) are **roughly the same in men and women**(1580, 2336, 2337), and one study in women reported one of the largest percent fiber cross-sectional area increases I recall ever seeing(2338). So, with women having **on average** a smaller absolute muscle mass, relatively less muscle (distributed towards the lower body), and smaller muscle fibers [suggesting perhaps a lower genetic and/or hormonal(565) baseline for increasing muscle size such the ceiling for muscle size is lower], women can certainly still increase muscle mass, but the magnitude and symmetry/aesthetics (distribution) of these changes will typically be quite **dimorphic**.
- Owing to sex hormone differences (testosterone), women have less hemoglobin(85, 2339, 2340) and a lower maximal aerobic power(2341), which, among other factors (especially relatively less muscle mass and greater body fat)(2341) puts them at a **performance disadvantage** during endurance exercise. However maximal oxygen consumption, when expressed relative to fat-free mass, is essentially equivalent for men and women(2342).
- **Given the above**, relative to men, tracking progress during the off-season to ensure **precision in guiding forward progress** can be, for some women (some of the time), like **trying to hit a moving target**. Luckily if you are a women reading this, you have the best seat in the house as your own coach to get a handle on menstrual status. Menstrual variation in performance may or may not(2315, 2326, 2343, 2344) manifest and menstrual status might be changing (e.g., when reversing out of a Pre-Contest deficit). The same holds true when/if hormonal birth control is employed or discontinued. Additionally, premenstrual symptoms can vary dramatically and on a month by month basis (for some)(2345, 2346) adding another layer of complexity.
- Incorporating a menstrual cycle app (computer

software) into your weekly progress markers (see [Section 1.2](#)) can be invaluable to learn how your mood, enthusiasm for training, strength, thermoregulatory abilities, water retention, *etc.* varies during your cycle to gain perspective on physiological changes and also plan around them (e.g., to schedule **deloads** when experience tells you training performance and progress will most likely suffer and/or you might make **undue inroads** into your recovery).

■ **Pre-Contest:** Body fat loss and muscle retention are the main goals here, from a body composition standpoint. (One might also focus on presentation and have other personal goals, such as “enjoying the journey,” or “keeping better balance” during prep, for instance, too.)

- Women tend to carry **more body fat**(2347), distributed into the lower body vs. abdominal area relative to men(2348, 2349). This becomes evident in puberty(10) and may affect disease risk later in life(2350).
- Of course, **sans pharmacological assistance, women won't get as lean as men on average**, due to essential body fat needed for normal physiological function. This is estimated to be about 4% for men(4) and just around 9% for women(5), although these are likely subject to individual variability.
- Regional differences in fat mobilization (secondary to **genetic and hormonal differences**) help explain the above differences on body fat distribution and the trouble areas that are the last to come of when dieting down(2348, 2351, 2352). For instance, estrogen upregulates alpha2(a) adrenergic receptors in the lower body(2351), which inhibit lipolysis when activated(2353), making mobilization from these areas more difficult for women.
- Interestingly, women tend to **oxidize more fat** (and less glycogen) during endurance(2354) and high intensity exercise(2355). Glycogen replenishment seems to be similar in women vs. men(1440), but resting muscle glycogen(2356, 2357) and thus the dietary carbohydrate need to increase glycogen may

vary across the menstrual cycle(2358).

- It's been suggested that men may be more successful than women using the same **weight loss strategies**(2359). The numerous studies of obese subjects don't confirm that men lose fat more readily, generally speaking(2360), although some studies point towards the possibility of an advantage in relative weight loss in favor of (obese) men following the same diet(2361). However, men may more readily lose **visceral adipose tissue**(2308, 2362-2364), an effect not entirely explained by the larger amount of visceral fat they typically carry(2362).
- According to the **law of diminishing returns**, when losing body fat, the amount of fat-free mass (we'll call it a surrogate for muscle mass) one loses along the way increases, the leaner one is (2365). [This is sometimes referred to as the **P-ratio** –the “partitioning ratio” – reflecting the amount of protein lost for a given energy deficit(2285, 2286).] This has been determined mainly in studies of obese women (2366), but of course, varies among individuals(2285). Gender differences have not been thoroughly explored(2366), but if we assume ~5% sex-specific essential body fat differences(5) as a lower limit, this rule of partitioning suggests that **for any given percentage body fat**, women may risk more muscle loss when dieting down (and won't get as lean, of course).
- The balance of **training stimulus and recovery is even more tenuous** Pre-Contest (due to caloric restriction), so the suggestions above to closely **monitor potential effects of menstrual status** apply, especially when prepping for a show. Recognizing the impact of premenstrual water on appearance, both during prep and on stage (see below) can be very important to have an accurate gauge of one's stage readiness.
- The body fat aesthetic in the less muscular women's divisions (NPC and IFBB Pro Bikini and Figure) favors a somewhat evenly distributed body fat (rather than a more typical gynoid fat distribution

with greater lower body fat). Because there is some truth to the saying that, "You're only as lean as your leanest body part," some women may need to diet to a very low level of **body fat overall** to meet the **lower body** (glutes and thighs) **standard** of judging. If this is your strategy, a solution to getting marked down for excessive leanness (vascularity, etc.) may be to intentionally soften up by loading with sodium and water slightly during the hours before going on stage. On the other hand, a **peak week** protocol (see [Section 4.8](#)) may help **slightly** to improve appearance in those who need to look leaner (and have an even greater effect in the unlucky case of premenstrual water arriving around show time). Perhaps more importantly, peak week creates **structure** and can be a fun **distraction** during the sometimes nerve-wracking days before stepping on stage.

It seems like most (non-tested) bodybuilders use pharmaceutical diuretics to make weight/drop water during Peak Week... Why don't you do that yourself and with clients?

Many strategies have been used to make weight in bodybuilding and other weight-class restricted competitions, including vomiting, laxative use, sauna/hot rooms, fasting and of course diuretic use ([2367](#)). It's been my experience and the consensus with many other bodybuilders and coaches that **diuretics** could be the most dangerous (and unpredictable) of these acute weight loss strategies in bodybuilding. A study of UK bodybuilders (both recreational and competitive) found that 22% had used diuretics([2368](#)). Nearly 50% of men's bodybuilders at the 1988 Jr. USA's (a national level, non-drug tested competition) reported diuretic use([1997](#)), whereas only 6% of competitors at a drug-free show reported diuretic use([2369](#)).

Logically, the danger of these drugs depends on how they are used: I have known many bodybuilders to use various diuretics to successfully drop water and make weight, although most agree that their effects are somewhat variable (especially if used repeatedly, e.g., over the course of several shows spaced closely together – see below). This can mean there's some guesswork involved if using them repeatedly during a competition season.

Here are some other points worth considering in the context of diuretic use to make weight/drop water:

- Carb and sodium intake also involve some artistry, but this is much less likely to be lethal or nearly as potentially medically dangerous as diuretics use can be, especially given the ease of overdoing it (pills are easy to swallow), especially under Pre-Contest peak week duress and when “diet brain” maximally impaired. Accounts of bodybuilders who have been hospitalized (or died) in connection with diuretic use include Paul Dillett, Albert Beckles, Momo Benaziza, Mike Matarazzo, and Andreas Münzer(2370-2372). I have personal friends who have been in very dire straits (full body cramping) after diuretic use that was only remedied by massive fluid and electrolyte intake. (Using electrolyte replacement drinks is **no substitute for emergency medical treatment**, especially without any real knowledge of plasma/body electrolyte status.)
- It might make dropping water easy, but many bodybuilders who use diuretics in the last days before a competition, water balance seems to be so disturbed that **simply repeating a protocol on a weekly basis isn't feasible**. The post-diuretic use rebound water retention can be such a medical issue(2373-2377) that standardizing a peak week dosing schedule if/when contests are only a week apart would not be feasible in many cases, and sometimes drying out for a show is just not possible. [This latter situation typically means a competitor has upped his/her dose of diuretics in a last-ditch (unsuccessful) effort to dry out, making matters worse for the long term.] For someone who unfortunately goes off the rails with eating (salty) junk food the days after competing with the help of diuretics, a rebound that involves pitting edema and even a trip to the emergency room is not unheard of.

Rather than discuss the differences in mechanisms of action and kinds of diuretics (loop, potassium-sparing and thiazide diuretics, Aldactone, etc.), I've presented a way to promote diuresis with diet and mild OTC diuretics (dandelion and caffeine) in the (long) section **4.8 Peak Week**. Diuretics are not needed(2265) and are typically tested for in natural organizations, as per World Anti-Doping Agency standard S5(2378). I've never employed pharmaceutical diuretics in contest prep, nor have I recommended them to those I've coached, including IFBB Pro and 202 Mr. Olympia Dave Henry (IG: [davidhenryifbbpro](#)). Another friend and well-known Italian

bodybuilding coach Gabriele Trapani (IG: [docgabritrap](#)) formulator for Yamamoto Nutrition and coach to numerous Italian bodybuilding champions and Olympia competitors contacted me several years ago and has since then applied my peak week approach to many of his clients. (I've enjoyed vicarious coaching along the way, thanks to Gabriele, and he's not reported a single medical issue to me in the time I've known him related to using this strategy.)

What are your thoughts on using intermittent fasting, either to diet down or to stay lean when adding muscle mass?...



Intermittent fasting (IF), sometimes called time-restricted eating, is essentially a means of energy deprivation designed to make use of the potential health benefits of caloric restriction, such as life extension and reduced risk of atherosclerosis, cognitive dysfunction, etc(2379). As an extension of the “rate of living” hypothesis(2380), there seems to be a metabolic clock, influenced by oxidative stress (2381), that dictates the rate of aging(2382). [This explains how caloric restriction extends lifespan(2379, 2382).] Practically speaking, the typical IF dieter restricts food (and other xenobiotics, including supplements, caffeine, etc.) during 16-20 hours of the day, leaving a ~4-8hr “feeding window” (e.g., a “16/8” IF regimen) for consuming all nutrition, supplements, etc. (Most IF’ers I’ve come in contact with also use a **nutrient timing approach** such that workouts are nestled in close temporal proximity to food intake.)

The health benefits of IF, including reduced risk of cancer, cardiovascular and other metabolic diseases, seem to come simply from the prolonged (regular) lack of food intake (“fasting”), **even without caloric restriction**(2383-2385). In other words, IF seems to confer some of the health benefits of caloric restriction even if one isn’t restricting calories *per se*. Its possible IF’s benefits may be

conferred via alterations in the gut microbiome(2386), as well as entraining the activity of the GI tract, e.g., the liver(2387) and other organs via gut signaling(2388), and/or encouraging the degradative cellular housekeeping (lysosome-mediated autophagy) necessary for cellular health(2389, 2390). Anecdotally, for bodybuilders who are pushing the limits of food intake (during the Off-Season), one way of “togglng” food intake for GI health is “taking a day off” by every week or two by skipping a few meals, which equates to a **very intermittent mini-fast** of sorts.

The body of scientific literature comparing intermittent fasting with its counterpart (good old reduced calorie dieting) is still in its infancy(

INTERMITTENT FASTING

PROS



Creates
Structure

Health
Benefits

Feasting-Type
Meals are fun /
pleasurable

Fits “9 - 5”
Lifestyle

©Scott W. Stevenson

CONS



Difficult to
Consume
Enough Food

Prevents
Protein Pacing

Feasting may
be socially
unacceptable /
inconvenient

Diet approach
may trigger /
promote
disordered
eating

1972), but getting more attention due to the poor long-term effectiveness of mainstream dietary interventions (2391-2393). Two recent reviews suggest intermittent energy restriction (of various

protocols, not just a typical 16/8 IF) was on par with daily energy restriction when it comes to fat loss(2391, 2394). However at one extreme (one meal/day only), IF without caloric restriction may confer fat loss, but – you guessed it – this comes at the expense of an increase in hunger overall(2395), although its often found [perhaps due to ketogenesis, as ketones inhibit appetite(1831)] that time-restricted eating patterns diminish hunger(2394). One mouse study in mice found that the **metabolic benefits of IF** (reduced fat accumulation, improved insulin sensitivity, diminished inflammation and oxidative stress, etc., and molecular markers thereof) were retained **even if the IF was abandoned on the “weekends”** (2 days per week of *ad libitum* feeding)(2392). So, there’s promise for this strategy as a **practical application**(1972) in the context of a 7 day work week, which explains why it's become so popular.

A study of resistance training male athletes (where training protocols were controlled) found that IF (16/8) produced greater fat loss than spreading meals out over the day, but at the cost of reduced testosterone, IGF-1 and thyroid hormone (T3) without an improvement in blood lipids(2396). Many of the same researchers performed a study with previously active, but not resistance trained men who ate freely on training days (3x/week)(2397) but were constrained to a 4-hour feeding window the other 4 days of the week. This lead to under-consuming protein on non-training days (~80g or less/day) and, although not statistically significantly different, the IF group failed to gain DEXA-measured lean body mass compared to a 2.3 (~5lb) gain in the subjects eating the control diet and following the same training regimen. Interestingly (but not surprisingly), both carbohydrate and **caloric intake** (with protein intake nearly reaching significance) on time-restricted feeding days **correlated with gains in hip sled strength** in the IF group.

So, while the scientific data are still incoming as to IF’s bodybuilding application, here are a few potential Pro’s and Con’s for your consideration:

Pro’s of Intermittent Fasting

- IF constrains eating times, constructing a pattern which may help some individuals with **adherence**(2391, 2398). [Only > 20% (3/14) of subjects in the IF group in the aforementioned resistance training study(2397) did not adhere to the protocol well enough to remain in the study.]
- IF may confer the aforementioned **health benefits**.
- For those who like to “eat big” this allows that and may

create a rewarding “feasting” type of way to eat.

- This pattern of eating seems to fit well with the lifestyle that comes with a “**9 to 5**” **workday**.

Con's of Intermittent Fasting

- It may be difficult to **consume enough calories** and/or protein during the feeding period. For a bodybuilder who needs to take in >4000kcal during a 4-8hr period, this could be nearly impossible (and/or highly uncomfortable).
- Eating **large quantities of food** in a short time may not be **practical** given other responsibilities, or even **socially acceptable** on some occasions.
- Intermittent fasting **disallows distribution of protein intake** over the course of the day, ala a “protein pacing”(397, 659, 1429, 1796, 1972) that optimizes anabolism(398) and prevents muscle loss(410).
- Cramming your daily caloric intake into a brief period may be reminiscent of **binging** akin to a bulimia nervosa type binge/purge cycle, possibly triggering recurrence or even development of **disordered eating**. (This has been a common concern of those I've talked to about IF who have a history of disordered eating.)

For a bodybuilder who has already made significant progress in his training over the years, **further improvement** often means dotting all i's and crossing all t's when it comes to training and recovery, fighting tooth and nail for every ounce of new muscle. Such an advanced bodybuilder may simply **need to consume more food than is possible in a typical IF feeding window**, and conversely, avoid (however small) negative impact on recovery that "fasting" (eschewing incoming nutrients) might have especially when dieting down. **Very large bodybuilders** have been known for their dietary extremes, but historically this has not included a pattern of success using fasting to help build more Off-Season muscle and/or retain more muscle Pre-Contest. On the other hand for those bodybuilders who weigh the health and lifestyle benefits of IF heavily (and don't wish to maximize muscle mass at all costs, depending upon which division she/he competes in), IF may offer dietary structure that's convenient and easy to adhere to.

Should I Eat Organic?

The term “organic” is a labeling distinction of the USDA National Organic Program indicating that a given food or agricultural product was produced via: “cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity. Synthetic fertilizers, sewage sludge, irradiation, and genetic engineering may not be used.” As of 2018, there were well over 41,000 USDA certified organic operations, and over 100 “agents” accredited to certify an operation (farm, etc.) as a certified organic operation(2399). An alternative to organic certification is offered by Certified Naturally Grown (CNG; <https://www.cngfarming.org>), a non-profit organization set up to assist small-scale, direct-to-market farmers. Wholesome Food Association (<http://www.wholesome-food.org>) is a United Kingdom sister organization to CNG.

Organic farmers use animal and crop wastes, natural “nonsynthetic” pest controls, minimal animal medications (vaccinations/antibiotics), and specific synthetic materials that are easily broken down by oxygen and sunlight, pollution and organic livestock must consume organic feed. During the three year period leading to organic certification, some states permit a transitional designation, allowable by the USDA(2400). (See below for more on transitional certification).

The “organic” movement was born legislatively in 1990 when the USDA introduced the Organic Foods Production Act as part of the Farm Bill(2401). A meta-analysis published in 2012 using 240 studies found that consuming organic foods will reduce exposure to pesticide and antibiotic-resistant bacteria (1173). However, there was no **clear** benefit in terms of clinical effects (e.g., on allergies) or improved serum levels of pesticides and nutrient from consuming organic food, but only a very few studies of this sort have been performed. In 2017, another review noted some evidence of higher nutritional value in organic vs. “conventionally” grown food – likely of marginal nutritional importance – but reiterate the importance of organic farming in limiting society-wide antibiotic resistance (2402).

One source of difficulty in delineating the benefits of organic farming lies in the considerable variability in the toxins (heavy metals, pesticides, mycotoxins, etc.) across studies and as a function of the food under study and general practices of a farm (2403). A 2006 review found heavy metal content in organic produce is generally the same in conventional vs. organic (1750), whereas a Dutch study found heavy metals to be absent in organic products(2404). Mycotoxin (toxic fungal metabolite) levels are highly variable across comparative studies(1750): Levels are generally similar in conventional and organic cereals in France(1175), but may also be higher in other

countries in staple foods like oats (Poland) (2405) or apples (Spain) (2406).

Here are some other important points to note about certified organic food:

- While seafood is not yet considered in the USDA organic standards(2399), livestock is.
- The organic standards are only spelled out **somewhat generally** for all livestock, including what they are fed (organic certified matter), use of drugs (e.g., hormones) and antibiotics, but living conditions are not delineated specifically by species (e.g., square footage free-living area for chickens)(2399). “**Free range**” or “**free roaming**” simply means that “producers must demonstrate to the Agency that the poultry has been allowed access to the outside(2407)
- While organic practices may reduce the prevalence of antibiotic resistance bacteria on the farm(2404, 2408), **cross-contamination** may explain why in some cases, conventional and organic chicken are equally contaminated with antibiotic resistant *E. Coli* by the time the meat is for sale in stores(2409).
- Grass-feed beef also has a lower ratio of **omega 6:omega 3 fatty acids**(2410), and this varies relative to the ratio of grass:grain in the animal's diet (545, 2411)]. Grass feeding can also change the beef's **color** due to **carotenoid content**, as well as the **flavor** of the beef(544), making it **less desirable**(2411).
- **Organic-fed cattle can indeed be (organic) grain-finished** , as long as those **grains meet organic standards**(2399). Organic standards do require greater pasture time (grass feeding), exercise and (fibrous) roughage that can potentially(2412) promote healthier meat(2399, 2413).
- Organic **milk** (from organic-raised cattle) is higher in o **mega-3 fatty acids**(2414-2416) and **conjugated linoleic acid** (CLA)(2414), the latter of which may translate into higher CLA in mother's breast milk(2417).]
- Over the course of a decade, one study found that flavonoid enrichment of organically grown tomatoes increased gradually (with no change in conventionally

grown comparison crops)(2418). This suggests that the **nutrient content** of produce from organically certified farms should improve **beyond the three year period** needed to satisfy certification requirements(2419) and that it's relevant to ask **how long a farming operation has been certified organic**, for instance, if you're buying at a farmer's market.

So, should you eat organic?... Well, that will come down to how much you value the impact of organic practice on animal and human welfare and taste (good or bad – see below) versus the added cost, as well as how convenient it is for you to find organic food. Here are some factors to help you decide whether, and to what extent organic is for you:

Strengths of Organic Products

- Organic produce does indeed seem to reduce levels of **pesticide** and **antibiotic-resistant bacteria**, generally speaking, and may have higher levels of some **nutrients**.
- Organic milk and beef may have a healthier **fatty acid profile**.
- The National Organic Program's practices are the basis for small CNG-certified (<http://www.cngfarming.org>) farmers you may find at your local market. (Local farmers markets can be located using [http://www.localharvest.org/.](http://www.localharvest.org/))
- **Certified Naturally Grown** is based on the FDA's National Organic Certification (but does not allow the use of the term "organic"). This is an alternative certification geared especially for small farmers you might find at your local farmer's market.

Potential Unknowns of Organic Products

- **Some synthetic substances** are still allowed in organic farming.
- The **conditions for housing** are not explicitly described for each species, so there can be some **variations** depending on what a particular farmer feels is suitable for each animal.
- The exact practices of a given farmer may vary from

those of another: Organic is a **certification**, not a **guarantee**.

- Products produced organically may not necessarily be healthy, *per se*! **An organic brownie is still a brownie.**
- Organic does not specify the relative **grass/grain in the diet of cattle** or whether cows are grain or grass-finished in the weeks before going to slaughter.
- Pesticide and toxin contamination can come from **rainwater and pesticide drift** from neighboring farms(2420).
- Organic certification does not apply to **seafood**.
- Organic foodstuffs are more **expensive**, in terms of both production costs and purchase price.
- Variability by type of fruit and animal species, what livestock are fed, climate, other farming practices, and country of origin can all play a significant role in the quality of a given foodstuff, even if certified organic.
- Long-since banned, but **environmentally persistent pesticides may still contaminate** organic produce(2421). For example, DDT may have a half-life in soil longer than 30yr(2422)).
- **Packaging matters**, too: A recent sampling of >500 commercial **plastic products** (including those that were supposed to be Bisphenol-A free), nearly all of them leached chemicals with **estrogenic activity** (measured per cell proliferation of a human breast cancer cell line) when exposed to everyday use (like microwaving, UV radiation, and exposure to saline or ethanol)(2423).
- Some studies have suggested that better taste is a primary reason consumers purchase organic(2424, 2425). On the other hand, just **believing something is organic** may make it taste better(2426, 2427). **Blinded taste** comparisons don't show a clear-cut advantage in favor of organic (2428-2432). (Still, if you think it tastes better, it tastes better!)

Harvesting in the Organic Jungle

Speaking with others along the trail – grocers, farmers, fellow shoppers, restaurateurs and even those involved in legislation – should

serve you well when foraging in the “food jungles” of today’s restaurants, grocery stores and farmers’ markets. Here are some tidbits to help guide you if you decide to “go organic.”

- Look for the USDA Organic Label



- Check out the USDA website information on Organic Labeling Standards: <https://www.ams.usda.gov/grades-standards/organic-labeling-standards>.
- **Transitional products** are those from an operation at least 12 months into the 3yr period of organic certification. Look into **local (state) transitional certification** with your grocer, local farmers, state government or transitional certifying groups like OIA North America.



- Talk to farmers at the local farmers market, those you are referred to, or those you find at [Local Harvest \(www.localharvest.org\)](http://www.localharvest.org), and ask specifically about the use of cleaning products, type of soil enrichment, grass and roughage fed to cattle, living conditions, *etc.*
- REMEMBER that [Certified Naturally Grown \(http://www.cngfarming.org\)](http://www.cngfarming.org) is based on the FDA's National Organic Certification (but does not allow the use of the term "organic"). This is an alternative certification geared especially for small farmers you might find at your local farmer's market.



- Weigh for yourself what it means as far as taste (try samples when you can) and animal welfare in comparison to the extra costs of organic food sources. (Clarify your own personal reasons for buying

organic.)

- **Price Look-Up Codes** (PLU Codes) are 4 digit codes you'll often see on the sticker on produce or its display. A "9" at the beginning of the code (making it 5 digits) indicates organic. Conventionally grown will simply have the 4 digit code, and eventually (when those numbers run out) a 5 digit code beginning with "8" in the range of 83000 to 84999 (2433).

Meat and Poultry Labeling Terms

A list of the meaning of the **USDA's Labeling Terms for Meat and Poultry** can be found at via: <https://www.fsis.usda.gov/wps/portal/fsis/home>. This includes definitions for the following terms:

- Basted or self-basted
- Certified
- Chemical free
- Free range or free roaming
- Fresh poultry
- Frozen poultry
- Fryer-roaster turkey
- Halal and zabiha halal
- Hen or tom turkey
- Kosher
- "Meat" derived by advanced meat/bone separation and meat recovery systems
- Mechanically separated meat
- Mechanically separated poultry
- Natural
- No hormones (pork or poultry)
- No hormones (beef)
- No antibiotics (red meat and poultry)
- Organic
- Oven prepared
- Young turkey

Using the FDA's pesticide monitoring program's data, the Environmental Working Group (<https://www.ewg.org/>) came up with lists of the most (Dirty Dozen: <https://www.ewg.org/foodnews/dirty-dozen.php>) and least (Clean Fifteen: <https://www.ewg.org/foodnews/clean-fifteen.php>) likely conventionally grown fruits and vegetables to contain pesticide residues, respectively. When buying organic is not an option, the **below list** can help guide you in avoiding pesticides in conventionally grown fruits and vegetables.

Table 22: Environmental Working Group's Clean Fifteen™ and Dirty Dozen™.

<i>EWG's Clean Fifteen™</i>	<i>EWG's Dirty Dozen™</i>
Asparagus	Apples
Avocado	Celery
Broccoli	Cherries
Cabbages	Grapes
Cantaloupe	Hot Peppers
Cauliflower	Nectarines
Corn (Sweet)	Peaches
Eggplant	Pears
Honeydew Melon	Potatoes
Kiwi	Spinach
Mangoes	Strawberries
Onions	Sweet Bell Peppers
Papayas	Tomatoes
Pineapples	
Sweet Peas (frozen)	

What do you think about the growing trend to employ CBD oil to deal with joint pain?

The use of *Cannabis*-derived cannabidiol (CBD) oil most definitely seems to be on the rise in the bodybuilding world, where most seem to be using it to counter (joint) inflammation, as well as improve **sleep** and even **appetite**. Currently, the market for CBD is growing rapidly(2434) alongside the progressive legality of marijuana in many states in the US(2435). Medical research exploring cannabis' benefits is growing out of its infant stages (2435), and the **large variety of cannabinoids**(2436) found among the various strains of

the plant(2437, 2438) bodes well for creating symptom-specific medicine(2435). On the other hand, *Cannabis* use during adolescence and young adulthood is strongly associated with **abnormalities in brain structure and impaired cognitive performance**(2438), suggesting that care be taken when manipulating this receptor system.

Both CBD and THC (Δ^9 -tetrahydrocannabinol) are cannabinoids, but only THC binds the CB1 cannabinoid receptor [as well as the CB2 receptor as does CBD (2439)]. This lends *Cannabis* its psychoactive effects, but makes CBD extracts devoid of the “high” of marijuana use(2440). CBD consumers are using it for a variety of health issues, such as depression, anxiety, sleep disorders and, of course, pain(2441). While CBD has a good safety record with reduced side effects compared other drugs used for treating, for instance, psychotic disorders and epilepsy, it's not been thoroughly examined toxicologically, e.g., as to its impact on hormones (2442). [However, **marijuana** is known to have a number of adverse effects on sex hormone levels and various aspects of reproduction in both animals and humans(2443).] Still, a substantial amount of studies have been carried out with animals suggesting the CBD could be effective in treating many inflammatory states, such as arthritis and joint pain, encephalitis, lung inflammation, colitis and even Alzheimer's disease(2440).

Perhaps because of its structural similarity to arachidonic acid(2440), CBD **reduces inflammation** by inhibiting the COX(2) enzyme (2444) [reducing prostaglandin synthesis in the same way as NSAIDs(2445)] However, CBD's actions are complex and it may even act via a novel antiinflammatory mechanism(2440). CBD was effective in reducing chronic inflammation and neurogenic pain in an animal model(2446), but combined THC/CBD may only be effective in some, but not all human patients suffering neurogenic pain(2447, 2448). On the other hand, THC/CBD may shift heat-and cold-related pain thresholds in MS patients(2449), perhaps by affecting the TRPV1 (capsaicin) receptor(2440, 2446), and this cannabinoid combination relieves pain-related **sleeplessness** for many patients(2450) CBD counters inflammation in a mouse model of rheumatoid arthritis(2451), but perhaps most importantly for our purposes, CBD applied **topically** reduced knee joint inflammation and signs of pain in a similar study (this time using rats) (2452). **Blood plasma** levels of CBD **increased** linearly with increasing topical doses, and absorption was also better when the CBD oil was massaged into the knee. Importantly, there was a generalized reduction in pain (tested via a paw withdrawal latency test), which corroborates that the CBD had a **systemic analgesic effect**.

This leaves us with the issue of how reducing inflammation

could counter the hypertrophic effects of weight training, which I've covered previously in the context of the glucose disposal agent metformin (Section 3.7) and in Section 3.6 on Supplement Stacking, Timing and Hormesis. In brief, inflammation, in the right amount, is essential to the hormetic stimulus that drives adaptation, so countering it with CBD oil may impair muscle growth. However, the **“devil's in the dose”** and **timing**: The antiinflammatory actions of the appropriate amount of CBD could possibly optimize inflammation, and dose timing(697) may be crucial to mitigate interference with hypertrophic muscle remodeling.

In the United States, the FDA is working to clean up a CBD marketplace where the large number of CBD products don't meet labeling requirements and many do not match label claims (2453). In much the same way that the structure of anabolic androgenic steroids(2454) and selective androgen receptor modulators (SARMS) (2455) has been played upon to change the pharmacology of these drugs, the diversity of cannabinoid molecules (2436) theoretically lends itself to fine-tuning the effects of cannabinoids. However, it seems that medical science has some work to do (not to mention the FDA) before we can reliably expect to purchase OTC cannabinoid receptor agonists that are specific to inflammation, sleep or appetite(2442, 2456).

Chapter 7 – Bodybuilding Resources

The value of knowledge increases, the more it's shared. –Scott Stevenson

7.1 BookSpecific Resources

Perceived Recovery Status (PRS) Scale

10	Very well recovered / Highly energetic	Expect Improved Performance
9		
8	Well recovered / Somewhat energetic	
7		Expect Similar Performance
6	Moderately recovered	
5	Adequately recovered	
4	Somewhat recovered	
3		Expect Declined Performance
2	Not well recovered / Somewhat tired	
1		
0	Very poorly recovered / Extremely tired	

Figure 17: Perceived Recovery Status (PRS) Scale(116).

Post Contest Period Readiness Scale

Post-Contest Period Readiness Checklist				
	Good	Typical	No So Good	Your Score
Perceived Recovery Status Score	PRSS = 7-10 +2	PRSS = 4 - 6 0	PRSS = 0 - 3 -2	
Joint, Tendon, Etc. Pain?	None 0	Moderate -2	Extreme -3	
Injury Status?	None +1	One - Two (mild) (-1) x Injury Count	Several	
Relationship / Personal?	Intact +2	OK 0	Shakey -2	
Water Balance is Normal	Yes +1	Kind of 0	No -2	
Appetite Controlled	Yes +1	Kind of 0	No -2	
			Your Total:	

Table 23: Post-Contest Readiness Checklist. The scores for all 6 items can thus be tallied. (See Section 2.1 for more on this checklist.) Positive total scores suggest readiness to pursue Post-Contest training and diet with vigor, whereas a negative total score suggests you should closely address those items where you scored poorly. (Naturally, any negative scores deserve attention, even if you have an overall positive score!)

7.2 General Bodybuilding Resources

Books (Some Also Cited in Text)

- Brooks GA, Fahey TD, and Baldwin KM. *Exercise physiology: human bioenergetics and its applications*. Boston: McGraw-Hill, 2005, 877 p. 0072556420
- Hall JE. *Guyton and Hall textbook of medical physiology*. Philadelphia, PA: Elsevier, 2016, p. xix, 1145 pages. 9781455770052
- Llewellyn W. *Anabolics E-Book Edition* Molecular Nutrition 2011, p. 1049 pages. https://www.amazon.com/Anabolics-E-Book-William-Llewellyn-ebook/dp/B005II5Z7M/ref=la_B001K8TZ8O_1_1?s=books&ie=UTF8&qid=1474490806&sr=1-1
- MacIntosh BR, Gardiner PF, and McComas AJ. *Skeletal muscle : form and function*. Champaign, IL: Human Kinetics, 2006, p. viii, 423 p. 0736045171 (hardcover) Table of contents <http://www.loc.gov/catdir/toc/ecip057/2005003557.html>
- Meadows JM, Stevenson SW. *Brutality of Mountain Dog Training*. Meadows JM, Stevenson SW, eds. Columbus, OH, USA: Published by John Meadows; 2015: <https://mountaindogdiet.com/products/eb2-brutality-of-mountain-dogtraining/>.
- McDonald L. *The Women's Book*. 2017. 978-0-9671456-9-3 <https://bodyrecomposition.com/>
- Mooney M, and Vergel N. *Built to survive : HIV wellness guide*. Prescott, Ariz.: Hohm Press, 2004, 184 p. Table of Contents: <http://www.loc.gov/catdir/toc/ecip0422/2004020671.html>
- Netter FH. *Atlas of human anatomy*. Philadelphia, PA: Saunders/Elsevier, 2014. 9781455704187
- Stevenson SW. *Fortitude Training®*. Stevenson SW, ed. Tampa, FL, USA: Published by Scott W. Stevenson; 2014: <https://www.fortitudetraining.net>

Reference Materials, Nutrition Trackers, Calculators, Etc.

- NutritionData.com – Food Tracking <http://nutritiondata.self.com>
- MyFitnessPal.com – Food Tracking, Etc: <https://www.myfitnesspal.com>

Medical Practitioners (See Also Chapter 6 FAQ on Aches n’ Pains)

- **Dr. Eric Serrano, MD** in Pickerington, OH, USA: 417 Hill Rd N Ste 400; Pickerington, OH 43147; (614) 833-5520. Personal physician to my friend **John Meadows**, as well as many other high level competitive bodybuilders and strength athletes. <https://www.healthgrades.com/physician/dr-eric-serrano-xrbph>
- **Dr. John Crisler, DO** (see also his Youtube channel), men’s health physician: <http://www.drjohncrisler.com/index.html> and <http://www.allthingsmale.com/index.html> (see the discussion board here: <http://www.allthingsmale.com/community/>)
- **Acupuncturists** local to your area who might be particularly suited to helping with bodybuilding-specific sports medicine concerns can be found via <http://www.acufinder.com>. In particular, I suggest clients look for those who are AOBTA-certified in **Oriental bodywork** (such as Tui Na) and/or internal/external martial artists (Kung Fu, Xing Yi Quan, Ba Gua Zhang, etc.) and are also herbalists.
- **Active Release Technique** (ART; <http://www.activerelease.com>) practitioners, often chiropractors, physical therapists and/or physiotherapist usually have great success treating musculoskeletal issues.
- **Derik Farnsworth, IFBB Pro** is an ART practitioner located in San Diego, CA who specializes in working with physique competitors. He can be reached telephonically at 1-619-606-1598
- **Dr. Natalie Graziano, DPT,OTR/L** (mobile) uses instrument-assisted soft tissue manipulation (among

other PT modalities) to relieve myofascial adhesion (that may restrict training or posing ability), treat (overuse) injuries and help physique and fitness competitors present, train and perform at the best of their abilities. Instagram (@drgrazmusclerestoration): <https://www.instagram.com/drgrazmusclerestoration/>
Website: www.drgraztherapy.com

Bodybuilding Coaches from Whom You Can Learn

- Scott Stevenson (who?): www.fortitudetraining.net; www.byobbcoach.com
- John Meadows: www.mountaindogdiet.com
- Jordan Peters: www.trainedbyjp.com
- Corrine Ingman: www.trainedbyjp.com
- Ken “Skip” Hill: www.teamskip.net
- Shelby Starnes: www.shelbystarnes.com
- Victoria Felkar: www.victoriafelkar.com
- Cornelius Parkin: <https://www.deconnutritionandtraining.com>

Bodybuilding Posing Resources

- IFBB Pro Janeen Lankowski (Tampa, FL): <http://janeenlankowski.com>
- The **internet** is loaded with amazing bodybuilding posing routines you can learn from. Lee Labrada’s “How to Pose like a Pro” is a great resource that is posted various places on the internet, including here: <https://youtu.be/pi2r-6kpn1s>

Bodybuilding Websites and Social Media

- Website for this book and its resources: www.beyourownbodybuildingcoach.com or simply www.byobbcoach.com
- My website: <http://www.drscottstevenson.com> for articles, my discussion board and book/training System:

Fortitude Training® (also see www.FortitudeTraining.net)

- My Facebook (Scott Stevenson): <https://www.facebook.com/scott.stevenson.927>
- My Instagram (@fortitude_training): https://www.instagram.com/fortitude_training/
- My Twitter (@IBBFortitude): <https://twitter.com/IBBFortitude>
- John Meadows' website Mountain Dog Training (www.mountaindogdiet.com) where you can find his training programs, apparel and other products: www.mountaindogdiet.com. **Buy any training program and get a month's free membership on the site.**
- Jordan Peters' and Corinne Ingman's website, chuck full of information Trained by JP (www.trainedbyJP.com)
- Intensemuscle.com: www.intensemuscle.com to find information on DC (DoggCrapp) training and more from Ken "Skip" Hill (see Coaches above).
- AdvicesRadio.com : www.AdvicesRadio.com to find recording of my podcast (**Muscle Minds**) cohosted by Scott (with Scott McNally).

For Aches n' Pains (See **Chapter 6 FAQ** above on This Topic)

- **Kwan Loong Oil** This is a topical analgesic and antiinflammatory that works great for sore knees, tendons, etc. You can apply it before lifting and put a (neoprene) sleeve or a wrap over the affected area. Also, for chronic pain, you can apply it 2-3 times/day with mild heat. It is discussed in detail in the answer to a **FAQ** in Chapter 6. Available on amazon: <http://www.amazon.com/Prince-Peace-KwanLoong-liquid/dp/B000Y1S94E>
- **Dit Da Jow (Die Da Jiu)** "Trauma Hit Wine" used to "move blood" and treat minor muscle tears in Chinese Medicine. Dit da jow not be used in lieu of consulting a medical professional. www.amazon.com or via a local acupuncturist/herbalist.

- **Cissus Quadrangularis** As a dietary supplement in particular for achy joints, one would take 500mg of material 1-2 times daily 30min before eating. Available at Truenutrition.com <https://truenutrition.com/p-1099-cissus-quadrangularis-201-extract-500mg-capsules-100-capsules.aspx>
- **Cosamin DS** Is a widely available glucosamine/chondroitin combination supplement, supported by clinically to reduce pain and improve function in sufferers of knee osteoarthritis(2143, 2457), and one I've seen improve pain for several clients (and myself). Available at www.amazon.com and stores such as Costco®.
- **Glucosamine (GLC2000)** Another glucosamine formulation that works well, in my experience. <http://www.glcdirect.com/glc2000/index.php>
- **Alflutop** This is a bit of a gray market product, but I'll mention it because it's been around quite some time, seems to be effective, and, as far as I know (unlike others), is legal to obtain and use (in humans) in the United States. [Although it has been available on and off for well over a decade on E-bay and amazon.com and a search of www.fda.gov comes up empty at the time of this writing (Summer, 2018), this is no guarantee of legality. It is **your responsibility to confirm legality** where you live before procuring or using this product, should you choose to do so.] Alflutop is described as a natural product, actually made from fish skeleton, and would be injected intramuscularly, or, in a research or clinical setting **only**, into an affected joint(2458, 2459). It seems to have antiinflammatory, tissue (cartilage) rebuilding(2460) and hyaluronidase inhibiting activity(2461). The product is produced by a Romanian company called Biotechnos. <https://biotechnos.ro/>

Digestion and Related (See also [Section 3.6](#))

- **Digestive Enzymes** There are several digestive enzyme products I have found to work well when “eating big:”
 - **Enzymedica Brand Digest Gold™** works really well I have found, but they are quite pricey. <https://>

enzymedica.com/collections/digestive/products/digest-gold-enzymes-digestive-enzyme

- **Bioptimizers™ Masszymes**, created by former competitor Wade T. Lighthouse: <https://bioptimizers.com/masszymes/>
- **Enzymatic Therapies Mega-Zyme®** <https://www.enzymatictherapy.com/Products/Digestion/Occasional-Heartburn-and-Indigestion/04250-Mega-Zyme.aspx>
- **Now Foods Super Enzymes** <http://www.amazon.com/NOW-Foods-Super-Enzymes-Tablets/dp/B00130XKJA>

- **Cu Ling (aka Culing, Curing Pills, and Kan Ning Want)** Cu Ling is a Chinese herbal formula to treat general indigestion and "food stagnation." Comes as tablets and in vials of small pellets (e.g., at <http://www.bestchinesemedicines.com/curing-pills.htm>). The second formulation seems to be stronger in my experience. You can buy the tablets for general use and the vials of pellets to take "emergency action." Various sources including www.amazon.com.
- **Benefiber®** is a soluble fiber supplement that often helps remedy both constipation and diarrhea. You can find it at www.benefiber.com or at Walmart and Walgreens.
- **Super Dieter's Tea®** is a mild laxative tea made with senna (*Cassia angustifolia*). It can be used during peak week to help with bowel movements to prevent abdominal distension. Available at grocery stores, drug stores and www.amazon.com.
- **MD's Ultimate Glucose Disposal Agent** is a blend of ingredients for glucose disposal. Useful during carb-ups. (See Section 4.8 Peak Week.) Designed by Dr. Bill Willis for John Meadows and for sale at True Nutrition. <https://truenutrition.com/p-1153-mds-ultimate-glucose-disposal-agent-500mg-capsules-180-capsules.aspx>

Cardiovascular, Renal and Liver Health (See also Section 3.6) PLEASE CONSULT WITH A PHYSICIAN IF YOU HAVE A MEDICAL ISSUE.

- **Liv.52 Herbal Blend** by Himalaya™ is used to treat various liver conditions and as a "liver protector." <http://www.liv52.com/>
- **Organ Guard** by CTD Sports is a combination of alpha-lipoic acid, N-Acetyl Cysteine and silymarin (from milk thistle), plus citrus bergamot blend (HMG CoA Reductase Inhibitor) with CoQ10. <https://ctdsports.com/products/organ-guard>
- **HeartCare® (aka Abana®)** is an Herbal Blend also produced by Himalaya™ and used to promote cardiovascular health. <http://www.himalayawellness.com/research/abana.htm>
- **Both Carditone® (Ayush Herbs®) and Serpina (Himalaya™)** contain *Rauwolfia serpentina*, which may have blood pressure lowering effects: Available at www.amazon.com.
- The herb **Arjuna** is sold by **Himalaya™** as a “versatile cardioprotective” and may also have renal protective actions (see [Section 3.6](#)).

Gym Equipment

- **Log Book Ring Binder:** Sold as an Index Card Binder (e.g., at www.staples.com), I have found these to be a great way to have a log book you can easily flip through to reference past workouts. You just buy new cards to once it's full. (I use small Velcro strips to hold a pen inside the binder.)
- **Hip Squat Belt** can be used for leg training without loading the spine. The SUPER SQUATS® Hip Belt found at www.ironmind.com.
- **Powerhooks** are dumbbell hooks by Country Power, that allow you to rack dumbbells on a barbell or smith bar, e.g., when doing a cluster set such as a Fortitude Training® Muscle Round: <http://www.powerhooks.com>.
- **Products at www.EliteFTS.com** I can recommend generally (You can also find many of my articles there.)
- **EliteFTS** sells the **Mountain Dog Band Pack** (John

Meadows' product) which contains the orange bands I use quite often (and are found in my gym bag – see FAQ above).

Gyms

- **Miami, FL, USA: Iron Temple Gym**, owned by IFBB Pro Tony Torres: www.irontemplegym.info; 12251 SW 112th St, Miami, FL 33186; Phone (754) 777-2918; ifbbprotonytorres@gmail.com (Bring your copy of this book with you and he get a free week at the gym!)
- **Chesterfield, MO, USA: House of Pain Gym**, owned by IFBB Pro Joe Corbett: www.houseofpain.com; 177 Chesterfield Industrial Boulevard Chesterfield, MO 63005; Phone (941) 527-0222
- **Tampa, FL, USA: North Powerhouse Gym**. www.powerhousegymnorthtampa.com; 13539 N Florida Ave, Tampa FL 33613; Phone (813) 961-0595; pgym14kt@aol.com
- **Tucson, AZ, USA: Undisputed Fitness and Training Center**; <http://undisputedaz.com>; 1240 N Stone Ave, Tucson, AZ 85705; Phone (520) 882-8788

Gym Apparel

- The House of Pain: www.houseofpain.com
- **Products at www.EliteFTS.com** I can recommend generally (You can also find many of my articles there.)

Dietary Supplements (Etc.) (See also [Section 3.2](#) for more on Dietary Fats, Protein and Carbohydrate)

- **Udo's Choice 3-6-9 Blend** can be found locally (preferably refrigerated) as well as on www.amazon.com.
- **Macadamia Nut Oil**: A high smoke point oil (can be used for cooking) that can be used to easily add calories to a diet largely via monounsaturated fatty acids. Available at local grocery stores and online at

www.amazon.com, for instance.

- **Extra Virgin Olive Oil** is a high monounsaturated fat source found in many grocery stores.
- **Extra Virgin Coconut oil** is a very tasty source of medium chain triglyceride (containing large amounts of lauric acid)(469).
- **Fish Oil:** True Nutrition Sells a fish oil (EPA, DHA) supplement that I trust: <https://truenutrition.com/p-1111-omega-3-fish-oil-1000mg-250-softgels.aspx>?
- **Organic Food:** Local Harvest (www.localharvest.org) is a search engine for farmers and farmers' markets selling organic products.
- **Protein Powders:** You'll find the best prices at www.truenutrition.com. (I would ask for Certificates of Analysis if you find bulk protein at cheaper prices somewhere else.)
- **Carbohydrate Powders:** Again, I think you'll find the best prices at www.truenutrition.com, but ask for Certificates of Analysis if you find bulk protein at cheaper prices.
- **Pre-packaged Supplements** can be had via TrueNutrition (EQW discount code; www.truenutrition.com) or Granite Supplements (sstevenson10 discount code; www.granitesupplements.com)
- **Pantothenic acid** (Vit B5) is **an option you can explore with a dermatologist** as an empirically (in my experience and that of clients) and research-supported(2462-2465) way to reduce/eliminate acne (vulgaris). (Typically one would take at least 1g and up to 5g per day(2464, 2465). The mechanism of action is likely due to an anti-bacterial effect(2463) (via sweating). Bulk powder is cheap, but it tastes terrible, so pills might be better for most. [A trick I have employed to swallow large amounts of nasty powder goes like this: Fill your mouth with water and tip your head back. Open your mouth and dump the powder in, give it a half of a second to start dissolving and then gulp the mouthful of water down as fast as possible (and chase with more water, too, just in case).] Vitamin B5 is ubiquitous, available locally and on

www.amazon.com.

- **Green Tea (Gunpowder):** This is a tasty green tea with what feels like a high caffeine content. Available on www.amazon.com.
- **Caffeine:** See Section 3.6 on Fat Burners. Available in bulk at www.truenutrition.com.
- **Yohimbine HCl:** See Section 3.6 on Fat Burners. This pre-workout stimulant, alpha-2 adrenoreceptor blocker and fat mobilizer is available in bulk at www.truenutrition.com. **Please be aware that some may not tolerate yohimbine well.** (See also Chapter 2 Special Section on Hormonal Manipulation which covers the topic of biological interindividuality.)
- **Powdered Drink Mixes (low calorie, artificially sweetened):** Bolero USA <http://www.bolerousa.net>
Phone (530) 4-BOLERO; Bolero.ny@gmail.com
(BLRCLASHOFCHAMP for 10% OFF.)

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